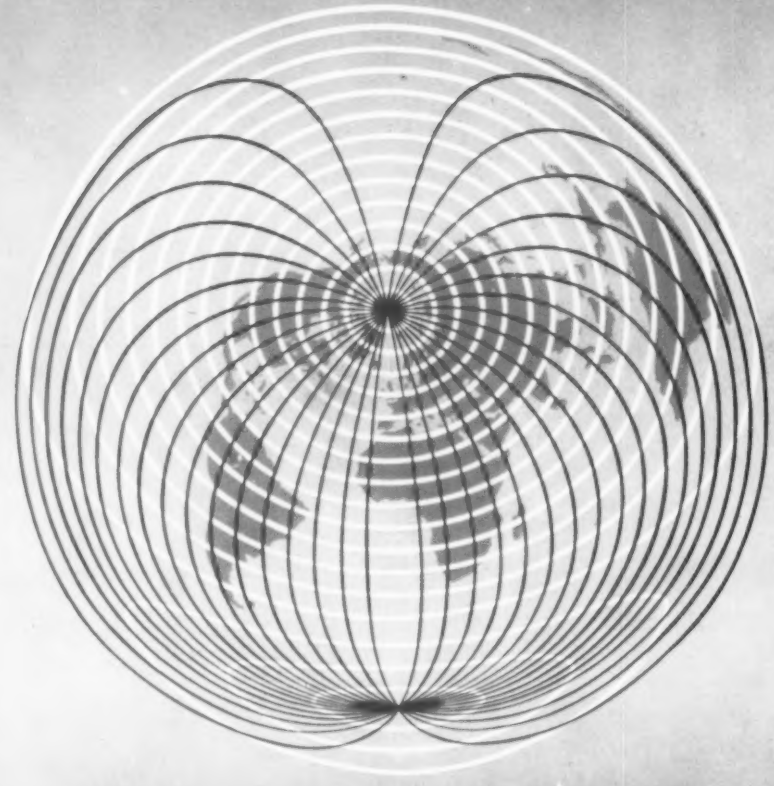
Wireless World

DECEMBER 1952 · TWO SHILLINGS



RADIO, TELEVISION AND ELECTRONICS

minus 75°C
to plus 250°C

For Radio Frequency
at Extreme Temperatures

BICC are now producing radio frequency cables insulated with P.T.F.E. (Polytetrafluoroethylene) capable of withstanding temperatures from minus 75°C up to 250°C. Inner and outer conductors are of silver-plated copper wire, while overall protection is provided by an impregnated glass braid.

Due to limited supplies we regret that this cable is only available against approved contracts.

B.I. Callender's

P. T. F. E. R. F. CABLES

BRITISH INSULATED CALLENDER'S CABLES LIMITED
NORFOLK HOUSE, NORFOLK STREET, LONDON, W.C.2

ALL-ROUND
DEPENDABILITY
AVO VALVE CHARACTERISTIC METER
AVO ELECTRONIC TESTMETER
AVO UNIVERSAL BRIDGE
AVO ELECTRONIC TEST UNIT
THE D.C. AVO MINOR
AVO WIDE RANGE SIGNAL GENERATOR
HEAVY DUTY AVO METER
UNIVERSAL AVO MINOR
UNIVERSAL AVO METER
AVO
Precision ELECTRICAL MEASURING INSTRUMENTS
Dependability is an essential quality in any good electrical testing instrument. Absolute dependability is the outcome of good design, suitability for purpose, and a high standard of accuracy. These indispensable factors are exemplified in all "Avo" Instruments, which are also noteworthy for their compact portability and robust construction.
You can depend on "Avo". When choosing instruments, consult our complete catalogue, a copy of which may be had free on application.
THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO. LTD.
WINDER HOUSE DOUGLAS STREET LONDON S.W.1
Telephone: VICtoria 3404-9

G 5

the finest
magnetic
recorders
and accessories
PANREK
PANREK MAGNETIC RECORDING LTD. 28 New Bond Street, London, W.1.
Telephone: MAYfair 3903 Cables: Panrek, London

ACTUAL SIZE

A High-Slope Low-Noise R.F. Pentode with low power consumption

Heater		Capacitances	
V_h	6.3 V	C_{in}	4.0 μμF
I_h	0.175 A	C_{out}	2.8 μμF
		C_{a-g1}	0.02 μμF
Characteristics			
V_a	120 V		
V_{g2}	120 V	**Limiting Values**	
V_{g1}	−2.0 V	V_a max.	180 V
I_a	7.5 mA	p_a max.	1.7 W
I_{g2}	2.5 mA	V_{g2} max.	140 V
g_m	5.0 mA/V	p_{g2} max.	0.5 W
r_a	0.34 MΩ	I_k max.	18 mA

Base B7G

The combination of good slope to capacity ratio, low noise factor, and low power consumption makes this new Mullard R.F. pentode an ideal valve for use in all types of communications equipment operating at V.H.F. Its slope to capacity ratio approaches unity, and this makes it specially suitable for use in Wide Band Amplifiers.

Used as a neutralized triode, and followed by a grounded grid stage (cascode), the EF95 has a typical noise factor of 3.5 when operated at 180 Mc/s.

With a heater current of only 0·175A., this valve shows a large saving in power consumption over previous valves of a similar class. This saving in power is emphasized in applications where large numbers of R.F. stages are involved.

The EF95 has identical characteristics to the American 6AK5 and may be used as a direct replacement for this valve.

For full technical information on this and other valves in the Mullard range please write to the address below.

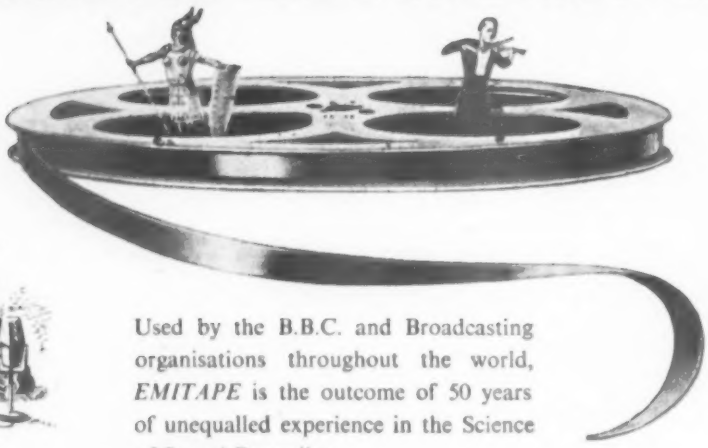
Mullard

MULLARD LTD · COMMUNICATIONS AND INDUSTRIAL VALVE DEPARTMENT · CENTURY HOUSE · SHAFTESBURY AVENUE · LONDON · WC2

MVT 111

EMITAPE

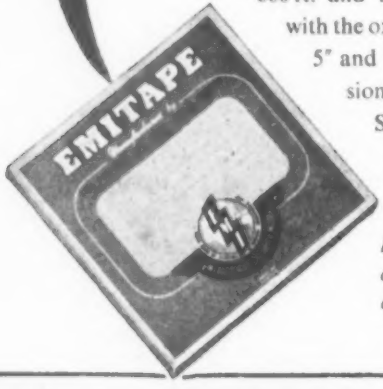
MAGNETIC RECORDING TAPE



Used by the B.B.C. and Broadcasting organisations throughout the world, *EMITAPE* is the outcome of 50 years of unequalled experience in the Science of Sound Recording.

EMITAPE is manufactured by E.M.I. (the Group which produces H.M.V., Columbia and Parlophone records).

Two types of *EMITAPE* are available, High Coercivity and Low Coercivity in 600 ft. and 1,200 ft. lengths wound with the oxide inside or outside on 5" and 7" spools. For professional users 11¼" European Spools (cap. 3,250 ft.) and NAB Spools (cap. 2,400 ft.) are available.



Full details of Emitape are available through dealers or direct from Sales Dept.

E.M.I. FACTORIES LTD.

HAYES · MIDDLESEX

E.M.I. FACTORIES LTD. HAYES, MIDDX.

FAULTLESS FLUXING

GIVES PRECISION SOLDERING

• Enthoven Superspeed has a continuous stellate core of ACTIVATED Rosin which gives an exceptionally high wetting and spreading power, enabling the flux and solder to be drawn rapidly by the force of capillary attraction into restricted spaces, even in the vertical plane. The activating agent volatilizes at soldering temperature.

• The distinctive stellate core ensures a more rapid release of flux and therefore immediate wetting by the solder, at moderate soldering-bit temperatures that lessen the risk of alteration to the electrical and mechanical properties of components.

PRECISION SOLDERING DEMANDS

Superspeed

• The flux in Enthoven Superspeed is always released in exactly the correct proportion. Dry and H.R. joints due to underfluxing or overfluxing cannot occur. One application of Superspeed always does the job effectively.

• The residue from Superspeed flux is non-corrosive and non-hygroscopic. It solidifies immediately to a hard, transparent film of high dielectric strength and insulation resistance.

SAVES TIME, CUTS COSTS

Superspeed

AN ENTHOVEN PRODUCT

"WHITE FLASH" *activated rosin-cored solder for general electrical, electronic and telecommunication work, and all standard uses. A.I.D. and G.P.O. approved. Complies with M.O.S. Specification DTD 599.*

ENTHOVEN SOLDERS LTD.

Enthoven House, 89, Upper Thames Street, London, E.C.4, Tel: Mansion House 4733 will gladly send you their comprehensive Superspeed booklet. Technical advisers are available for free consultation.

EXPORT HALTRON ONLY

HALTRON

ON LAND SEA AND IN THE AIR HALTRON RADIO VALVES ARE SERVING YOU

From our new address:

HALTRON HOUSE, 49/55, LISSON GROVE, LONDON, N.W.1

HALL ELECTRIC LIMITED leading Exporters of Radio receiving and transmitting tubes, cordially invite our esteemed clients, Government Departments, Armies, Navies, Air Forces and Civil Aviation authorities to send us their enquiries where they will find that we can supply most of their requirements from our large and comprehensive stock comprising some 800 types. Only thoroughly tested best quality tubes are shipped which will meet C.V. specification when required.

PROMPT DELIVERIES UP TO 200,000 VALVES WITHIN 14 DAYS

HALTRON **HALL ELECTRIC LTD** HALTRON

HALTRON HOUSE, 49-55 LISSON GROVE, LONDON, N.W.1

Tel: Ambassador 1041 (5 lines) Cables: Hallectric, London

Presenting . . .

The AB Miniature H Type Switch

A **MINIATURISED** version of the well-known A.B. 'H' Type Switch.

The same utter reliability that has made its big brother famous is engineered into this switch and its complete flexibility of application makes it a 'must' in equipment where space is at a premium.

Early deliveries can be given and we cordially invite your enquiries.

AB Metal Products Ltd

16 BERKELEY STREET, LONDON, W.1

Phone : Grosvenor 5206/7

PYE

AIRFIELD COMMUNICATIONS

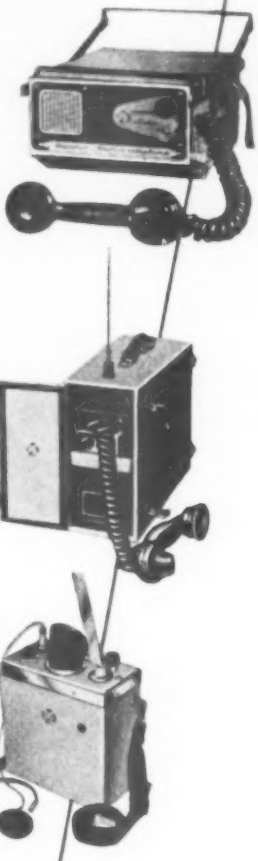
Control airport general utility trucks by V.H.F. radio.

This is one of the many tasks well suited to the Pye "Reporter" and the transportable version is ideal for maintaining contact with working parties.

Where communication with individual personnel is required, the Pye "Walkie-Phone," weighing only 8 lbs. including batteries, is recommended.

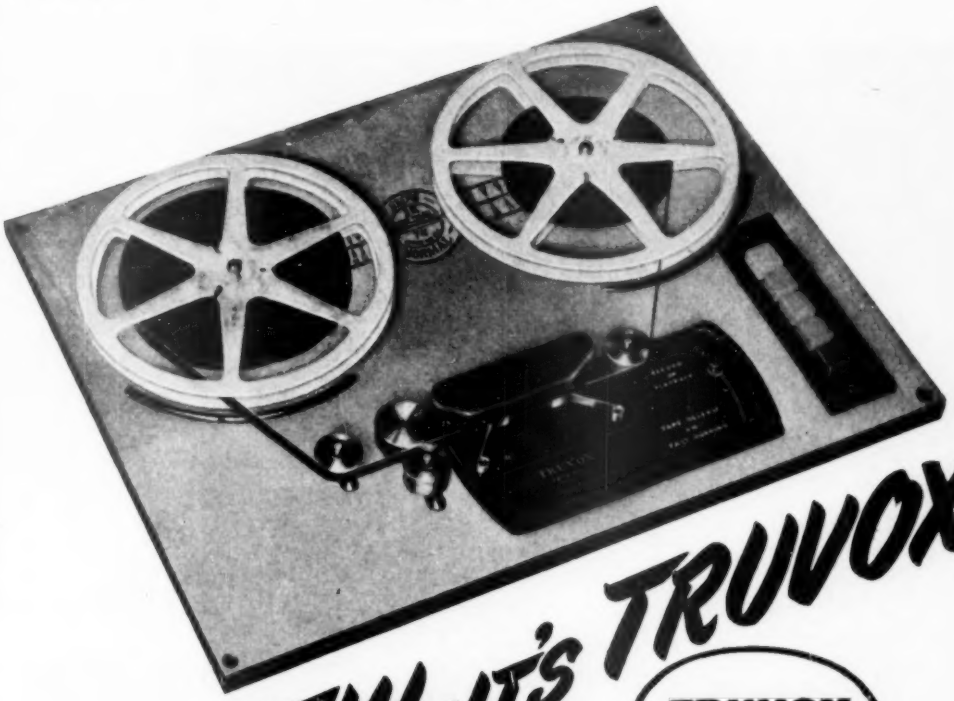
Pye 15 or 50-watt fixed stations can be used at control points also for ground to air communications.

When area coverage schemes are required, the Pye-Ericsson multiplex equipment will solve many problems.



Write for full details to :—

PYE LIMITED CAMBRIDGE · ENGLAND



IT'S NEW—IT'S TRUVOX

TRUVOX TAPE DECK MARK III

These are the main features :—

1. Three motor drive.
2. " Drop-in " Tape loading.
3. Push-button control, electrically and mechanically interlocked.
4. Separate push-button brake.
5. " Fast-forward " and " fast-rewind " without tape wear.
6. Silent drive eliminating " wow " and " flutter."
7. Half-track working, and two Tape speeds of 7½ inches per second, or 3¾ inches per second.
8. Visual playing-time indicator.
9. With a suitable amplifier, the equipment covers a frequency range from 50-10,000 c.p.s. at 7½ inches per second.

The deck is designed for building into complete recorders which can be handled by inexperienced personnel

22 Gns
MODEL TR2
200/250 volts
A.C. mains only

... and it's available ***NOW!***

TRUVOX LIMITED

EXHIBITION GROUNDS ◦ WEMBLEY ◦ MIDDX

Telephone : Wembley 1212

Sole distributors to the Wholesale Trade for Rola and Celestion Speakers

High stability quartz crystals

for frequency measurement and control

CUT from only the finest raw quartz, ***Standard*** high grade crystal units are obtainable to accuracies better than 50 cycles in one megacycle. Artificially aged, gold plated and suspended in vacuo, these crystals greatly reduce drift under working conditions. They will maintain this high degree of accuracy *under conditions of severe vibration* and *sharp changes in climatic conditions* such as are encountered in mobile communication equipment.

Standard **QUARTZ CRYSTALS**

Standard Telephones and Cables Limited

Registered Office: Connaught House, Aldwych, London, W.C.2

TELEPHONE LINE DIVISION North Woolwich, London, E.16 · ALBert Dock 1401

REGISTERED TRADE MARK
HUNTS
CAPACITORS
THE TRADE MARK OF RELIABILITY

FAST RELIABLE SERVICING

SPECIAL TELEVISION TYPES

Dry Electrolytic Capacitors for high ripple circuits. A comprehensive range of completely dependable capacitors designed specifically for Television applications. The types shown below cover the requirements of practically all the leading makes of Television Receivers currently in use, and are available from all leading wholesalers.

TYPE L 33

Cap. µF.	DC. Volts Wkg.	Surge	Ripple Current Max. m a	Dimensions L.	D.	Type Ref.	List No.	List Price
TYPES L.32 and L.33 EXTERNAL CLIP MOUNTING								
100 + 200	275	325	550	4"	1⅝"	L33	K255	28/6
60 + 250	275	325	500	4"	1¼"	L33	K271	28/6
100	350	400	550	4⅛"	1⅛"	L32	K136	13/6
60 + 100	350	400	450	4⅛"	1⅛"	L33	K178	18/6
60 + 120	350	400	500	4⅛"	1⅛"	L33	K152	19/6
64 + 120	350	400	550	4⅛"	1⅛"	L33	K128A	21/6
100 + 200	350	400	800	4⅛"	1⅝"	L33	K147	31/-
100 + 200	350	400	800	4⅛"	2"	L33	K189	31/-
60 + 250	350	400	450	4⅛"	1⅝"	L33	K207	29/-
64	450	525	600	4⅛"	1⅛"	L32	K102	13/-
TYPE L.35 TWIST PRONG MOUNTING								
150	350	400	350	4"	1⅛"	L35	K502	17/6
60 + 60	350	400	370	3⅛"	1⅛"	L35	K617	16/6
64 + 120	350	400	450	4⅛"	1⅛"	L35	K503	19/6

A. H. HUNT (Capacitors) LTD., WANDSWORTH, LONDON, S.W.18. Tel: BATtersea 3131. Est. 1901

FERRANTI

Transformers and Chokes

The 'H' range transformers and chokes are designed to meet the most stringent requirements for Service and Civil Radar and Radio Equipments. They are hermetically sealed and fully tropicalized, and their compactness is made possible by using 'C' cores of high efficiency. Each unit is individually tested. Components can be supplied to meet individual needs with ratings up to 1½ kVA at 50 cycles and correspondingly higher ratings at higher frequencies.

'H' range

Hermetically sealed. 'C' core construction

FERRANTI LTD. TECHNICAL SALES DEPARTMENT FERRY ROAD EDINBURGH 5

FERRANTI

ADVANCE COMPONENTS LTD., BACK ROAD, SHERNHALL STREET, LONDON, E.17 Telephone : LARkswood 4366/7/8

Modern in conception, design and performance, the E.2., with its exceptionally wide range, not only fulfils to-day's needs of radio and television, but anticipates the requirements of tomorrow. More than ordinary care has been used in screening and filtering. As a result, stray field is less than 3 μV. at 100 Mc/s.

● *Frequency accuracy of ± 1% extends over the whole range.* ● *Output voltage 1 μV. to 100mv. and approx. 1v. at full R.F. Socket.*

● *Internal modulation; external modulation to 80%*

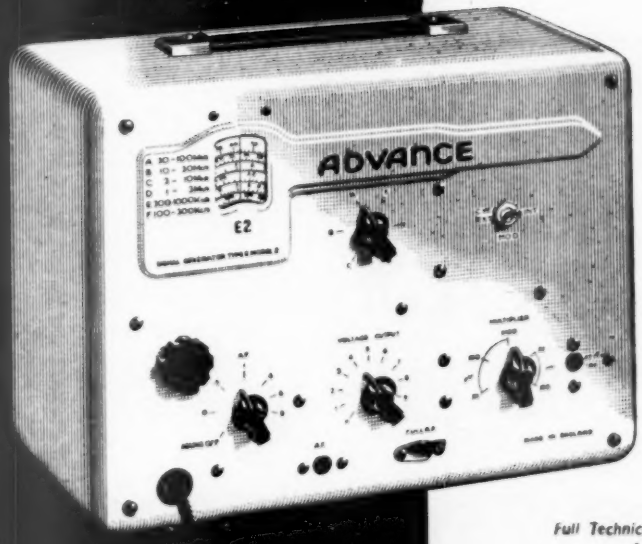
● *A.F. Output variable 0-50v. at 400c/s.*

● *Size 13" × 10½" × 8".* ● *Weight 17½ lbs.*

Advance
signal
generator

ADVANCE TYPE E2

100 Kc/s – 100 Mc/s ON
FUNDAMENTALS



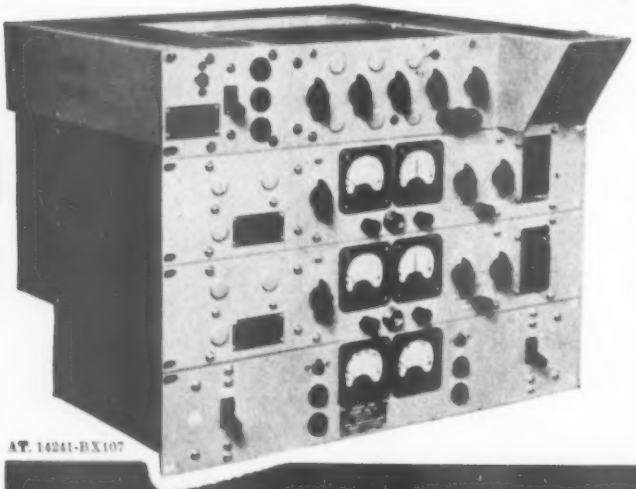
Full Technical Details available in Folder S/14/W

ADVANCE COMPONENTS LTD., BACK ROAD, SHERNHALL STREET, LONDON, E.17 Telephone : LARkswood 4366/7/8

FOR INCREASED ACCURACY

SUPPRESS SIGNAL DISTORTION

The distortion of signals by noise can be the cause of serious error occurring in messages transmitted by automatic radio telegraph. The noise-suppressing action associated with frequency-shift operation, makes it possible to operate automatic radio telegraph systems satisfactorily under conditions where "on-off" keying would result in an excess of errors in received signals. Being dependent upon frequency change rather than variation in signal amplitude the effects of fading are considerably reduced — particularly when dual diversity working is employed — permitting a considerable increase in usable time.



AT. 14241-BX107

Type FSK.2. Keying Unit for frequency-shift keying is designed for conversion of any conventional communications transmitter for frequency-shift operation.

Type FSY.7. Receiving Terminal is for dual diversity shift reception. It includes a cathode-ray monitor unit with which the balance of the two aerials and receivers in a dual diversity combination can be checked visually, and with which the correct tuning point of the two receivers can be set up while a transmission is in progress. Other models are available for single receiver reception.

Both these units can be fitted on site by station engineers, any modification of radio equipment required being only of a minor nature.

AUTOMATIC TELEPHONE & ELECTRIC CO. LTD.

Radio and Transmission Division, Strowger House, Arundel Street, London, W.C.2.
Telephone: TEMple Bar 9262. Cablegrams: Strowgerex, London.

MONOSCOPE TUBES

THE Monoscope is basically a simple caption scanner apparatus capable of providing a video signal derived from a fixed pattern within the tube.

Almost any pattern comprising pure line, halftones or a combination of both can be supplied on receipt of specific requirements, and two standard types are available.

Type J.101 — Test Chart "A"
Type J.201/XI — Test Chart "C"

TYPICAL OPERATING DATA

Deflection	*electromagnetic*
Focus	*electrostatic*
Vh	6·3 *V*
Vg (cut-off)	−50 *V*
Va1	1200 *V*
Va2 (focus)	800/850 *V*
Va3 (wall)	1200 *V*
V target	1160/1200 *V*
I target	5 μ*A*

Resolution better than 500 lines
Video Signal 0.5μA peak to peak (min)

CINEMA-TELEVISION LIMITED

A Company within the J. Arthur Rank Organisation

WORSLEY BRIDGE ROAD · LONDON · SE26

Telephone: HITher Green 4600

SALES AND SERVICING AGENTS

P. C. Robinson & Partners Ltd., 287 Deansgate, Manchester, 3
Hawnt & Co., Ltd., 59 Moor St., Birmingham, 4
Atkins, Robertson & Whiteford Ltd., 100 Torrisdale Street, Glasgow, S.2

CINTEL

REGISTERED TRADE MARK

MAGNETIC MATERIALS Extensive research and manufacturing facilities have established Mullard as the leading producers of magnetic materials. They were the first, for example, to introduce Ferroxcube, the world's most efficient magnetic ferrite; 'Ticonal' anisotropic permanent magnets, renowned for their high stability and high energy output; and Ferroxdure, an entirely new type of permanent magnet with the insulating properties of a ceramic.

The wealth of experience gained from these developments is available to all users of magnetic materials through the Mullard advisory service. An enquiry to the address below will put a team of specialised engineers at your disposal.

Mullard

Mullard

'TICONAL' PERMANENT MAGNETS · FERROXDURE PERMANENT MAGNETS
FERROXCUBE MAGNETIC CORE MATERIAL

MULLARD LTD., COMPONENT DIVISION, CENTURY HOUSE, SHAFTESBURY AVENUE, LONDON, W.C.2.

perfect balance

IN this imperfect world, a group of ideal units does not always assemble together to form the best complete system. In a radio receiver for example, limitations inherent in the technique sometimes make a response extending to the full limits of audibility undesirable. In such circumstances a *balanced* response gives a better overall result than one in which no attempt has been made to compensate for receiver losses in the upper frequencies

In addition to the high-fidelity, full range models, LECTRONA speakers are accordingly available in all basic types with response curves especially tailored to individual requirements

STANDARD TYPE. C 5102.
Diameter 5".
Flux density 10,000 lines per sq. cm
Peak power handling capacity (speech and music) 2 watts.
Speech coil impedance, 3 ohms at 400 cycles
Frequency response chosen to suit requirements.

Other models are available in this diameter, with alternative values of flux density and power handling capacity

LECTRONA LOUDSPEAKERS

Designed and Manufactured by

ACOUSTIC PRODUCTS LIMITED

STONEFIELD WAY, VICTORIA ROAD, RUISLIP, MIDDX. Phone: Ruislip 6093/4

SALES: **EDSTONE LIMITED**

15 BUCKINGHAM PALACE GARDENS LONDON S.W.1. Phone: Sloane 0621

TRUVOX

It Pays As You Earn!

EQUIPMENT

Profitable P.A. business is built upon a reputation for reliability which can only be based on the dependability of your equipment. That is why it pays to use only TRUVOX, the reproducers that have had reliability built into them for a quarter of a century.

TRUVOX PRESSURE TYPE DRIVING UNITS

Senior and Junior models have a power handling capacity of 15 and 10 watts respectively and provide a substantially linear response from 175 to 10,000 c.p.s. The Senior model is available with built-in tropicalised multi-ratio transformer, a noteworthy feature much appreciated by sound engineers.

TRUVOX REFLEX SPEAKERS

Senior models give a substantially linear response from 250 to 8,000 c.p.s. with a peak handling capacity of 8 to 10 watts whilst Junior models range from 350 to 8,000 c.p.s. with 6 to 8 watts peak handling capacity. Either can be supplied with built-in transformer. Completely weather-proofed and designed to withstand prolonged exposure and vibration.

For Full Details Write to :

ROLA CELESTION LTD., FERRY WORKS, SUMMER ROAD, THAMES DITTON, SURREY

'Phone : Emborbrook 3402-6.

Wholesale enquiries to—Truvox Ltd., Exhibition Grounds, Wembley, Middx. (WEM 1212)

Send for our fully illustrated Catalogue

THE HEART OF EVERY CIRCUIT

is to be found in its Transformer, which, like the human heart must keep the lifeblood flowing evenly and constantly under both normal and abnormal conditions.

POTTED COMPOUND FILLED TRANSFORMERS AND CHOKES

manufactured by WODEN have been designed to fulfil such a purpose, and for this reason they have been standardized by many leading Radio, Television and Electronic manufacturers and also Government Research Departments. Their choice is only made after exhaustive tests for accuracy and reliability. To merit this confidence, there is a constant need to provide components of the highest quality and our ample research and testing facilities ensure continued progress in this direction.

WODEN TRANSFORMER CO. LTD.

MOXLEY ROAD · BILSTON · STAFFS.

TELEPHONE: BILSTON 41959

I.T.L.

Examples from the New range of

TAYLOR INSTRUMENTS

Model 66A
Signal Generator

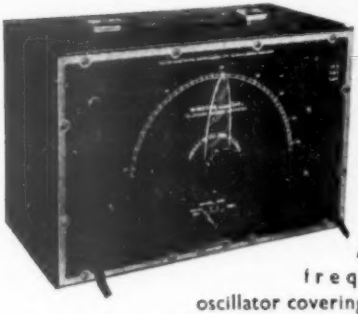
A new A.C. mains-operated R.F. Signal Generator of improved performance and reliability. Wide range and accuracy make it an ideal instrument for modern radio and television work. Range : 100 Kc/s. to 160 Mc/s.

List Price £22.10.0

Model 45B
Valve Tester

A comprehensive mutual conductance valve tester, suitable for most types of British, American and Continental valves. Supplied with valve manual giving data for testing nearly 3,000 valves. For use on A.C. mains.

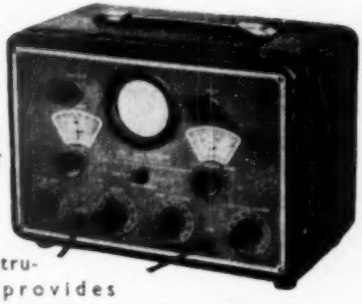
List Price £25.10.0



Model 240A
Pattern Generator

A high frequency oscillator covering a range from 40 Mc/s. to 70 Mc/s. with unmodulated or modulated output. Television receivers may be adjusted and set up in the absence of transmission. The modulated output produces white horizontal or vertical bars on the television screen.

List Price £14.0.0



Model 260A
Television Wobbulator

This instrument provides entirely self-contained visual alignment facilities for television receivers. Scientifically designed to assure simplicity in operation, accuracy and reliability. Carrier frequency range 5 to 70 Mc/s.

List Price £36.15.0

These instruments are available through your usual supplier. For full details of the complete range of Taylor instruments please write for our new 16 page catalogue.

★ **Illustrated instruments are available on Hire Purchase**

TAYLOR ELECTRICAL INSTRUMENTS LTD.

Montrose Avenue · Slough · Bucks. **Telephone : Slough 21381.**

G.E.C. SELENIUM RECTIFIERS

G.E.C. Selenium Rectifiers are ideal for all applications where a D.C. power supply is to be provided from an A.C. source. They are designed and rated for long life and reliable operation, have high operating efficiency and are economical in first cost. A comprehensive range is available for output currents from a few milli-amps. to thousands of amps

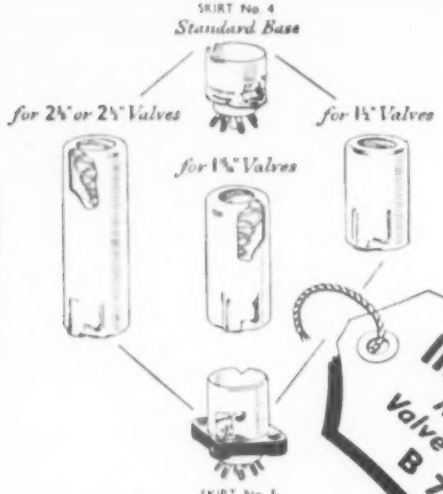
Full particulars available on application to :—

E.S.V. Dept., Magnet House, Kingsway, London, W.C.2

or the address below —

SALFORD ELECTRICAL INSTRUMENTS LTD · SALFORD 3 · LANCS

A SUBSIDIARY OF THE GENERAL ELECTRIC CO. LTD. OF ENGLAND



Recognised as the Most Reliable Valveholders

B7G Valveholders

are now available moulded in:—

Phenol Formaldehyde *(Black).*

Nylon loaded Phenol Formaldehyde *(Natural Brown).*

P.T.F.E.

and now **MYCALEX.**

Wholesale Enquiries:—

CYRIL FRENCH LTD.,
High St., Hampton Wick,
Middlesex. KIN. 2240.

Manufacturers' Enquiries: THE McMURDO INSTRUMENT CO. LTD., VICTORIA WORKS, ASHTEAD, SURREY
ASHTEAD 3401

PROBLEM-

145 × 2 × 3

SOLUTION-

The LAB TESTED CONTINUOUS STORAGE UNIT

BRITISH PATENT No. 680632

SAVE your slide rule—the real answer is 870—that's the number of different resistors in the 'T' & 'R' range—145 preferred types in two wattages and three tolerances.

Add to that, the fact that it is necessary to carry stocks of each, it's no wonder the problem of storage is a real headache—unless of course they're LABpak'd.

LABpak continuous storage units solve the whole problem giving positive segregation of ohmic values with finger type selection of card index simplicity. Carded LAB resistors may be added as stocks deplete and are readily obtainable from usual wholesalers. Furthermore, the continuous storage unit is FREE with a small initial order for 180 type 'R' or 240 type 'T' resistors, the values of which YOU can specify.

The scheme's well worth investigating—ask your wholesaler or drop us a line for illustrated list.

RESISTOR SPECIFICATION

Ref.	Type	Loading	Max. Volts	Range	Dimensions
T	½-watt	½-watt	250	10 ohms to 10 megohms	⅛" × ¼"
R	½-watt	1-watt	500		⅛" × ½"

Tolerance available ±20%, ±10%, ±5%

The Lab Continuous Storage Units are available from your normal source of supply, but more detailed information can be obtained on request.

THE RADIO RESISTOR COMPANY LTD.

50 ABBEY GARDENS, LONDON, N.W.8 · Telephone: Maida Vale 5522

SOLDERING COSTS CAN BE CUT...

Wolf

BEST VALUE FOR MONEY!

★ SOLDER TWICE AS FAST · AT FAR LESS COST!

TRIGGER-FEED
SOLDERGUN

The Wolf Type 51 Soldergun with its trigger feed action is indispensable to all modern assembly.

SOLDERGUNS

Off-straight easy-grip handle • Perfect balance • Solid construction • Low current consumption • Model for every purpose • Rapid constant heat

SOLDERING IRONS

Identical as regards elements and bits to Wolf Solderguns but with round hard wooden handle with heat-deflecting skirt.

ALTERNATIVE TYPES AVAILABLE

SOLDERGUNS

Type 31 Type 71
Type 41 Type 81

SOLDERING IRONS

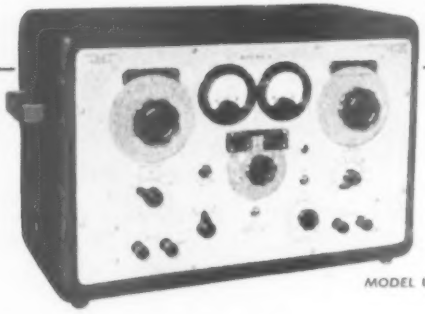
Type 32 Type 42

It pays to Solder with **Wolf** ELECTRIC SOLDERGUNS & SOLDERING IRONS * *Obtainable from all high-class stockists and ironmongers*

WOLF ELECTRIC TOOLS LTD., PIONEER WORKS, HANGER LANE, LONDON, W.5 - TELEPHONE: PERIVALE 5631-4

UNIVERSAL IMPEDANCE BRIDGE

BPL



MODEL UB 202

RESISTANCE RANGE: 0.1 ohm to 1,000,000 ohms. Basic range : 0.1 to 11 ohms continuously variable plus nine steps of 10 ohms.

CAPACITY RANGE : 10 pf to 1,000 mFds. Basic range : 10 to 1,100 pf continuously variable, plus nine steps of 1,000 pf.

INDUCTANCE RANGE: 10 microhenries to 1,000 henries. Basic range : 10 to 1,000 microhenries continuously variable, plus nine steps of 1,000 microhenries. 6-way multiplier.

BRIDGE FREQUENCY : 1,000 cycles supplied from internal valve oscillator. Visual null detector is incorporated in the instrument.

A general-purpose instrument covering a very wide range of measurements for values of resistance, inductance and capacity. When used for resistance measurement it is connected as a Wheatstone bridge, the required D.C. source of supply and the balance-indicating micro-ammeter both being incorporated in the instrument. When used as a capacity bridge, the condenser under test is connected in a modified De Saute's Bridge. The same dial as used for resistance measurement is used to balance the capacity of the unknown condenser, whilst a second dial in combination with a decade resistance balances the power loss. For the measurement of inductance the instrument is converted into a Hay's bridge

SENSITIVE PANEL MOUNTING METERS

SIZE	2½"	3½"	5"
RANGE	25μA to 50A	15μA to 50A	15μA to 50A

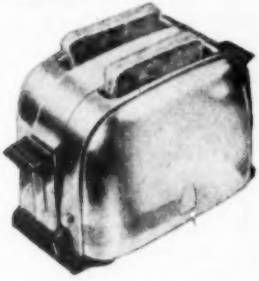
Prices on application

Available for immediate delivery from our Stockists, M.R. Supplies, Ltd., 68 New Oxford Street, W.C.1, or write to :

BRITISH PHYSICAL LABORATORIES

HOUSEBOAT WORKS · RADLETT · HERTS · Telephone · Radlett 5674-5-6

How are YOU fixed?



Morphy Richards Ltd. are using 10 Spire Speed Nuts on each Electric Toaster, and 2 on each of their 'Atlantic' Electric Irons. Like many other manufacturers, they have found that these fasteners give improved performance and efficiency while making substantial reductions in time, labour and material costs. They save time and labour through quicker and easier assembly; and they reduce material costs, because each fastener is 50/75% lighter than its old-fashioned predecessor.

SFP Spire Speed Fixes are used on the Toaster to assemble the piston and to fix the dashpot.

SCA Spire Speed Clips secure the control knobs on the Toaster and the Senior, Power and Atlantic models of the Iron.

SNU Spire Speed Nuts permit the blind assembly of the Toaster cowl.

SCO Spire Speed Clips retain the thermostat setting assembly at constant torque on the Atlantic Iron and Toaster. They also retain the trip knob and the piston on the Toaster.

Spire **SPEED NUTS** *fastest thing in fastenings*

Enquiries to:

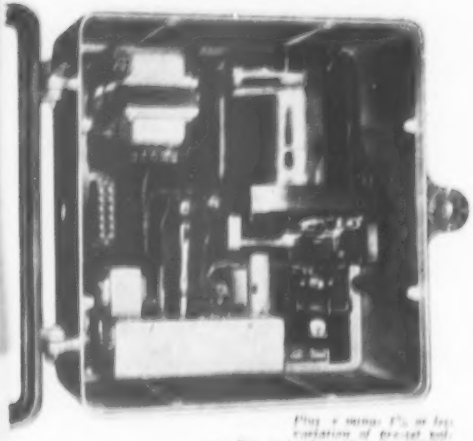
SIMMONDS AEROCESSORIES LTD., Byron House, 7-8-9 St. James's Street, London, S.W.1. Head Office & Works: Treforest, Glamorgan. Also Birmingham, Stockholm, Melbourne, Sydney, Amsterdam & Milan.

CRC 285

WHAT IS THE VALUE OF CONSTANT VOLTAGE?

The value of industrial processes completed without interruption? Of work in laboratories, hospitals, etc., saved from spoilage? Certainly it is more than the modest cost of the

FIELDEN SERVO A.C. VOLTAGE REGULATOR



Plug-in units fit to key variation of precise voltage. For single-phase 50 cycles 190/260 volts supplies. Output 300 V.A.

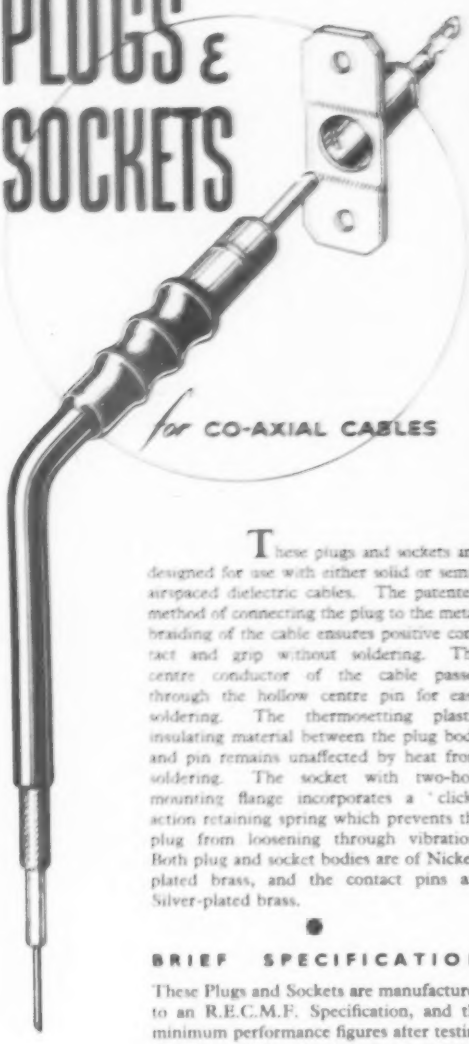
NO WAVE-FORM DISTORTION AND UNAFFECTED BY FREQUENCY CHANGE

Fielden
INSTRUMENTATION
COVERS MOST PHYSICAL MEASUREMENTS

Please send for Leaflet 205

FIELDEN (ELECTRONICS) LTD.
"N" Block, Paston Road, Wythenshawe, Manchester
also at London, Philadelphia and Melbourne.

PLUGS & SOCKETS



for CO-AXIAL CABLES

These plugs and sockets are designed for use with either solid or semi-airspaced dielectric cables. The patented method of connecting the plug to the metal braiding of the cable ensures positive contact and grip without soldering. The centre conductor of the cable passes through the hollow centre pin for easy soldering. The thermosetting plastic insulating material between the plug body and pin remains unaffected by heat from soldering. The socket with two-hole mounting flange incorporates a "click" action retaining spring which prevents the plug from loosening through vibration. Both plug and socket bodies are of Nickel-plated brass, and the contact pins are Silver-plated brass.

●

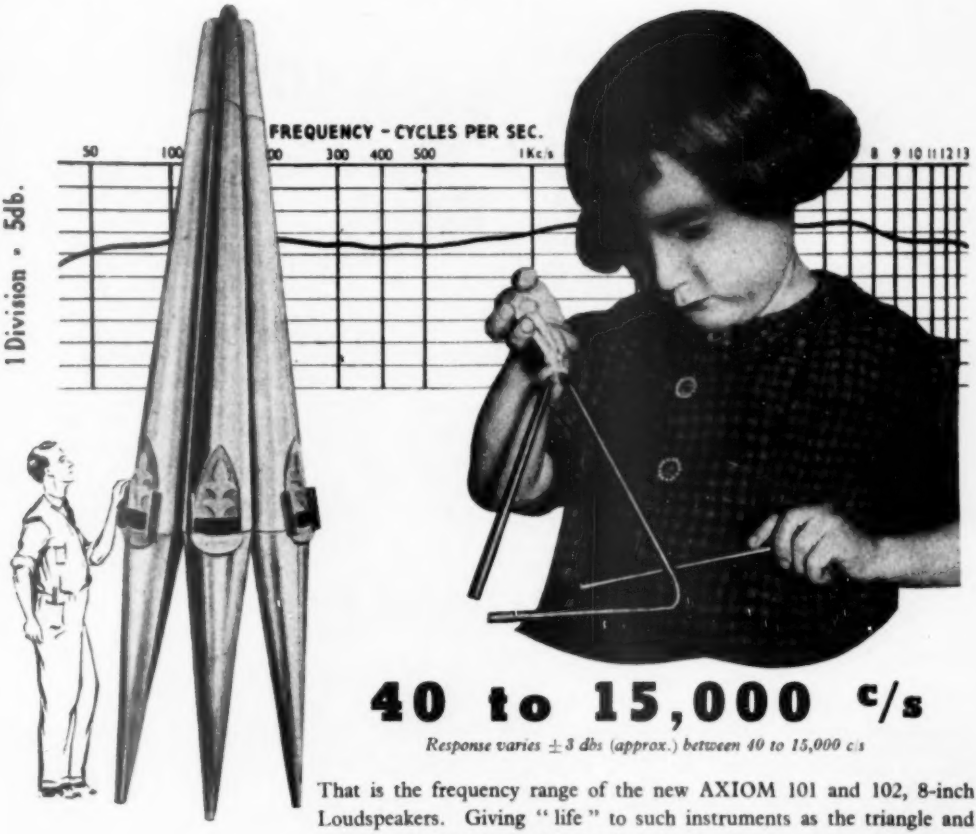
BRIEF SPECIFICATION

These Plugs and Sockets are manufactured to an R.E.C.M.F. Specification, and the minimum performance figures after testing to RIC/11 Yellow Specification INCLUDING TROPICAL EXPOSURE TEST, are :—

Capacity (Plug and Socket together)	5 pF max.
Contact Resistance (Outer Contacts)	10 millohms max.
Contact Resistance (Pin Contacts)	10 milliohms max.
Leakage Resistance	10 Megohms min.
Steady withdrawal force	6-16 lb.

PAT. NO. 637613

ANTIFERENCE LIMITED 67 BRYANSTON STREET LONDON W.1



40 to 15,000 c/s

Response varies ± 3 dbs (approx.) between 40 to 15,000 c/s

That is the frequency range of the new AXIOM 101 and 102, 8-inch Loudspeakers. Giving "life" to such instruments as the triangle and cymbal, yet with a fundamental resonance low enough to avoid bass distortion on even the lower register of the Cathedral organ, they have been designed to satisfy the demands of those who require "lifesize" reproduction in restricted living space. This is achieved with noteworthy smoothness throughout the whole frequency range and with an overall quality that can be fairly described as true high fidelity.

AXIOM 101. Fundamental Resonance 65 c/s (nominal); Voice Coil Impedance 3 or 15 ohms; Power Rating 5-watts peak A.C.; Flux Density 13,500 gauss; Total Flux 51,200 Maxwells; Frequency Response 40 c/s—15,000 c/s; Overall Diameter 8⅛ins.; Overall Depth 4⅛ins.; Voice Coil Diameter 1in.; Nett Weight 2¼ lb.; Finish, Grey rivelling enamel; Fixing Holes, 4 slots ⅜in. × 7/32in. equispaced on a 7⅛in. P.C.D. £7 2 9, including tax.

AXIOM 102 with increased sensitivity, has a higher magnetic flux and attendant improvement in the damping factor: Flux Density 16,000 Gauss; Total Flux 63,000 Maxwells; Overall Depth 4 7/16ins.: Nett weight 4 lb., £10/14/1, including tax.

You are invited to write for details of the other loudspeakers in the Axiom range, also specially designed reflex cabinets.

A TRADITION OF EXCELLENCE
FIDELITY
EFFICIENCY

GOODMANS

GOODMANS INDUSTRIES LTD., AXIOM WORKS, WEMBLEY, MIDDX WEMbley 1200

constant light source voltage

Constantly reliable readings or indications of any photometric device require a *constant* light source, which, in turn, demands *constant voltage*. Advance Constant Voltage Transformers keep the mains supply voltage steady to within $\pm 1\%$ with input variations of up to $\pm 15\%$.

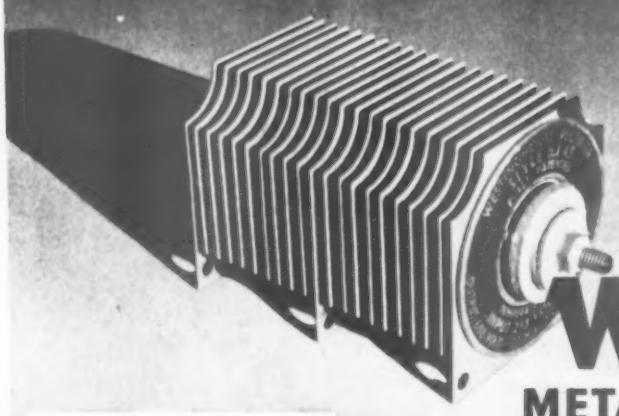
Full details in Folder S.15/W available on request.

Advance

ADVANCE COMPONENTS LTD . BACK ROAD . SHERNHALL STREET . WALTHAMSTOW . LONDON . E.17

Telephone: LARkswood 4366/7/8 *Telegrams: Attenuate, Walt, London.*

They are the most Reliable



WESTINGHOUSE

WESTALITE

METAL RECTIFIERS

Send 6d. for a copy of "THE ALL-METAL-WAY" to Dept. W.W.12.

WESTINGHOUSE BRAKE & SIGNAL CO., LTD., 82, York Way, King's Cross, London, N.1.

has any recording tape **You** *have used* **All** *these features?*

Sealed tin container

Attractive plastic spool

Competitive price

Consistent performance

Improved signal to noise ratio

Highest tensile strength

FROM the manufacturers who design and make Great Britain's finest recording equipment comes this new, finest-ever recording tape. Its new, easy-to-file pack, its new features making for such simple operation will be instantly apparent. Here at last is a tape which appeals to the most discerning of enthusiasts, enabling him to record accurately, truthfully and easily the most difficult of recording subjects.

Developed primarily for use in research laboratories, Simphonic Grade "A" is now available for you too to use with your own recorder. Ask for Simphonic Grade "A" when you next visit your sound dealer, and hear the difference for yourself

Price—Complete with spool and packed in sealed tin container, 35/- per 1200ft.

In case of difficulty write direct to —

TECHNICAL SPECIFICATIONS.

Simphonic Grade "A" tape.

Coercitivity	Approximately 250 Oersted.
Permanence	500—700 gauss
Echo	Not perceptible in current use.
Tensile strength	2 Kgs.
Elastic elongation for 1 Kg.	Under 1%
Permanent elongation for 1 Kg	Under 0.5%
Uniformity per reel	±0.5 db.
Uniformity between reels	2 db max.

SIMON SOUND SERVICE

48-50 George Street, London, W.1
Telephone: Welbeck 2371 (5 lines)
Telegrams: Simsale, Wesdo, London
Cables: Simsale, London

The Season's Greetings

We heartily wish all our many friends a Merry Christmas and a Happy and Prosperous New Year. We hope they will remember, during 1953, that—

1 We are agents for the leading types of radio and television test equipment, electronic instruments and industrial control apparatus and stocks are constantly maintained at our Showrooms in Manchester.

2 Our Factory at Cheadle, Cheshire, has been specially equipped and staffed for the development, design and manufacture of specialised non-standard electronic instruments.

3 Quick and skilled maintenance facilities are always available. Based on our Service Department at Cheadle, specially trained engineers are ready to carry out repairs and adjustments, either in our own workshops or at your premises.

F. C. ROBINSON & PARTNERS LTD.

SALES & SHOWROOM • **FACTORY & SERVICE**

287 DEANSGATE **COUNCILLOR LANE**

MANCHESTER, 3 **CHEADLE, CHESHIRE**

DEAnsgate 6601 **GATley 2469**

MAINS TRANSFORMERS

FULLY INTERLEAVED
SCREENED AND IMPREGNATED. ALL GUARANTEED.
ALL PRIMARIES ARE 200 250 v. Half Shrouded.

HSM63. (Midget). Output 250-0-250 v. 60m/a., 6.3 v. at 3 amps., 5 v. at 2 amps. 18/-
HS63. Output 250-0-250 v. 60m/a., 6.3 v. at 3 amps., 5 v. at 2 amps. 18/6
HS40. Windings as above. 4 v. at 4 amps., 4 v. at 2 amps Output 18/6
HS2. 250-0-250 v. 80m/a. 21/-
HS3. 350-0-350 v. 80 m/a. **HS30.** 300-0-300 v. 80 m/a. 21/-
HS2X. 250-0-250 v. 100 m/a. **HS75.** 275-0-275 v. 100 m/a. 23/-
HS30X. 300-0-300 v. 100 m/a. **HS3X.** 350-0-350 v. 100 m/a. 23/-

Fully Shrouded

FSM63. (Midget). Output 250-0-250 v. 60 m/a., 6.3 v. at 3 amps., 5 v. at 2 amps. 18/6
Output
FS2. 250-0-250 v. 80 m/a. 23/-
FS30. 300-0-300 v. 80 m/a. **FS3.** 350-0-350 v. 80 m/a 23/-
FS2X. 250-0-250 v. 100 m/a. **FS75.** 275-0-275 v. 100 m/a. 25/9
FS30X. 300-0-300 v. 100 m/a. **FS3X.** 350-0-350 v. 100 m/a. 25/9
All the above have 6.3 4-0 v. at 4 amps., 5-4-0 v. at 2 amps.
FS43. Output 425-0-425 v. 200 m/a., 6.3 v. 4 amps., C.T. 6.3 v. 4 amps., C.T. 5 v. 3 amps. Fully shrouded. 51/-
FS53. Output 450-0-450 v. 250 m/a., 6.3 v. 2 amps., C.T. 6.3 v. 4 amps., C.T. 5 v. 3 amps. Fully shrouded 75/-
P30X. Output 300-0-300 v. 80 m/a., 6.3 v. 7 amps., 5 v. 2 amps. Framed. Flying leads. 31/9
F35X. Output 350-0-350 v. 250 m/a., 6.3 v. 6 amps., 4 v. 8 amps., 4 v. 3 amps., 0-2-6.3 v. 2 amps. Fully shrouded. 71/6
FS160X. Output. 350-0-350 v. 160 m/a., 6.3 v 6 amps., 6.3 v 3 amps., 5 v. 3 amps. Fully shrouded. 47/6
FS43X. Output, 425-0-425 v. 250 m/a., 6.3 v. 6 amps., 6.3 v. 6 amps., 6 v. 3 amps. Fully shrouded. 69/-
HS6. Output, 250-0-250 v. 100 m/a., 6.3 v. 6 amps., C.T. 5 v. 3 amps. For receiver R1355. Half shrouded. 29/3
HS150. Output. 350-0-350 v. 150 m/a., 6.3 v. 3 amps., C.T. 5 v. 3 amps. Half shrouded 30/9
F36. Output. 250-0-250 v. 180 m/a., 6.3 v. 6 amps., C.T. 5 v. 3 amps. Fully shrouded. 32/6
FS120. Output, 350-0-350 v. 120 m/a., 6.3 v. 2 amps., C.T. 6.3 v. 2 amps., C.T. 5 v. 3 amps. Fully shrouded. 33/-
FS256. Output, 250-0-250 v. 80 m/a., 6.3 v. at 6 amps., 5 v. at 3 amps. Fully shrouded. 30/9
PR11. Output 230 v. at 30 m/a., 6.3 v. at 1.5/2 amps. 23/-
FS150. 350-0-350 v. 150 m/a., 6.3 v. 4 amps., 5 v. 3 amps 34/9
FS150X. Output, 350-0-350 v. at 150 m/a., 6.3 v. at 2 amps., C.T. 6.3 v. at 2 amps., C.T. 5 v. at 3 amps. Fully shrouded 34/9
The above have inputs of 200/250 v.

FILAMENT TRANSFORMERS

F4. Output, 4 v. 2 amps. **F6.** Output, 6.3 v. 2 amps. 9/-
F12X. Output, 12 v. at 1 amp., 9 -. **F6X.** Output, 6.3 v. 0.3 amps. 6/-
F12. Output, 12.6 v. tapped 6.3 v. at 3 amps. 18/6
F24. Output. 24 v. tapped 12 v. at 3 amps. 26/-
F12 and F24 framed with Flying Leads.
FU6. Output. 0-2-4-5-6.3 v. at 2 amps. 11/-
F29. Output, 0-2-4-5-6.3 v. at 4 amps. 30/9
FU6 and F29 clamped with Flying Leads.
F5. Output, 6.3 v. at 10 amps., or 5 v. at 10 amps., or 12.6 v. at 5 amps., or 10 v. at 5 amps. 37/9
F6.4. Output, four at 6.3 v. tapped at 5 v. at 5 amps. per winding giving by suitable series and parallel connections 24 v. at 5 amps., 20 v. at 5 amps., 10 v. at 5 amps., 15 v. at 5 amps., 12.6 v. at 10 amps., 10 v. at 10 amps., 6.3 v. at 20 amps., 5 v. at 20 amps. 57/-
F5 and F6.4 framed with Flying Leads.
FU12. Output 0-4-6.3 v. 3 amps. **FU24.** Output 0-12-24 v. 1 amp. 19/6
The above have inputs of 200/250 v.

OUTPUT TRANSFORMERS

HOP1. Ratios, 26, 46, 56, 66, 90, 120-1 50 m/a. max. current. C.T. for Q.P.P. Class B, etc. Secondary 2/4 ohms. Top panel and clamped, each 6/-
OP10. 10/15 watts output. 20 ratios on Full and Half primary 19/9
OP30. 30 watts output, 20 ratios on Full and Half primary 28/6
Williamson's O.P. Transformer to Author's specification £4/13/6
Chokes for Williamson's Amplifier. 30H. at 20 m a 10H at 150 m/a. 18/6 35/6
Choke C4. 60 m/a., approx. 8H., 350 ohms 5/-
Choke C5. 40 m/a., approx. 5H., 350 ohms 5/-
Choke C6. 50 m/a., 50H., 1,500 ohms 22/-
C8. 360 Micro henries clamped, **S3. C7.** 90 m/a 180 ohms, clamped 6/3
Belling-Lee Co-Axial Plugs. Type 642/P., each 1/3
Belling-Lee Co-Axial Sockets. Type 604/S, each 1/3

Quotations, etc.—stamped addressed envelope please.
C.W.O. (add 1/3 in £ for carriage).
Trade and also Export enquiries invited.

H. ASHWORTH (Dept. WW)
676, Gt. Horton Road, Bradford, Yorks

DUBILIER

MICA DIELECTRIC CAPACITORS

Eminently suitable for H.F. Transmitting and R.F. Heating Circuits.

Makers of the first, and of the largest Mica Capacitors in the World, Dubilier have maintained the lead in this important branch of Capacitor Engineering. The example shown is a solid filled mica capacitor in a substantial porcelain container. Screw threaded metal terminal bosses with large surface area contacts provide a convenient means of mounting.

These capacitors are designed for use as Grid and Anode stoppers, as By-Pass Capacitors in radio-frequency power circuits where a small radio-frequency component is superimposed upon a higher D.C. or low-frequency A.C. voltage, and in oscillatory circuit positions in low power radio-frequency transmitters and similar equipment.

Full details of these and other outstanding Capacitors are available upon application.

DUBILIER CAPACITORS

DUBILIER CONDENSER CO. (1925) LTD., DUCON WORKS, VICTORIA RD., N. ACTON, LONDON, W.3.
Phone: Acorn 2241 (5 lines). Grams: Hivoltcon, Wesphone, London. Cables: Hivoltcon, London, Marconi International Code

Wayne Kerr

VIDEO FREQUENCY OSCILLATOR

TYPE 0222A

now covers 10 Kc/s — 10 Mc/s

Model 0222A is introduced to meet the demand for an oscillator reaching 10 Mc/s. It is an improved version of the 0222 which it supersedes. All the outstanding features of the original model are retained, including low harmonic content and exceptional stability of frequency and amplitude.

Frequency Range: 10 Kc/s — 10 Mc/s in 6 ranges	*Frequency Accuracy:* 1%	*Output Impedance:* 75 ohms
Frequency Stability: less than 1 in 10^5 in 1 hour	*Output:* +10 db to −50 db on 1 V p—p	*Total Harmonic Content:* less than 1%

Amplitude constant to within ± ½db at any frequency setting

THE WAYNE KERR LABORATORIES LIMITED • NEW MALDEN • SURREY

the Connoisseur 3-speed *gramophone motor*

This new motor unit is another noteworthy achievement in the "Connoisseur" tradition. Full 12" turntable 33⅓, 45 and 78 r.p.m. The synchronous motor is virtually vibrationless and suitable for standard, transcription and microgroove recordings.

Connoisseur

Main turntable spindle, precision ground and lapped, runs in phosphor-bronze bearings. Low noise level and hum induction. Input voltages: 200-250 A.C. 50 cycles or 60 cycles to order at no extra charge.

Price without pick-up £16.10.0 plus £7.3.0 P. Tax

MODIFICATION FOR TWO-SPEED

Adaptor sleeve for "Connoisseur" Dual Speed Motor to give the third speed of 45 r.p.m. now available together with centre disc at a cost of 2/9 inclusive of purchase tax and postage.

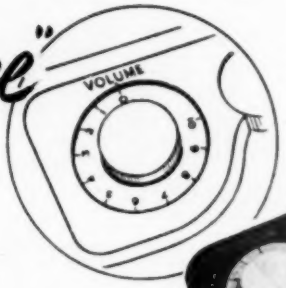
A. R. SUGDEN & CO. (Engineers) LTD.,

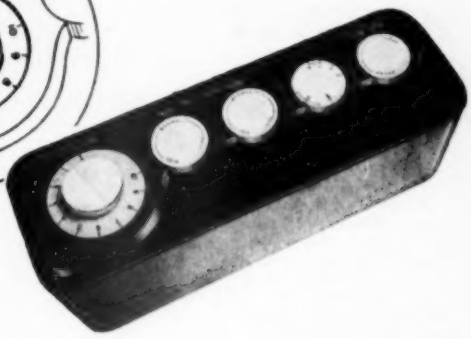
WELL GREEN LANE, BRIGHOUSE, YORKSHIRE.

Telephone: HALIFAX 69169

★ A POINT OF DETAIL No. 2 ★

"Volume"





In any amplifier capable of high quality reproduction, the influence of the volume control is significant and worthy of more attention than it receives in most "specifications." In the Q.U.A.D. final test pass figures, the effect of the volume control is an integral part of at least four measurements.

a. The frequency response of the complete equipment when set to level is within 0.3 db in the range 20-20,000 c/sec., *these figures being maintained at all settings of the volume control.*

b. The scale is divided into ten divisions. The grading of volume attenuation obtained is checked for accuracy within *one half of one division to a standard loudness scale.*

c. Distortion figures are measured with inputs up to ten times higher than those required to fully load, thus ensuring that *these figures will not be exceeded under practical conditions.*

d. The control itself operates by combined feedback and normal potentiometer action. In this way background is *never more than —75db or 4μV at the input*, whichever is the greater.

These may appear small points in themselves and they are no doubt covered with some degree of test in most amplifiers. Nevertheless, it is well to remember that the performance figures of the Q.U.A.D. amplifier are those which will be obtained in normal use and are not conditional upon exactly matched or balanced valves, non-reactive loads, low source input impedance, or other factors difficult or impossible to maintain in practical applications.

THE ACOUSTICAL Q.U.A.D. AMPLIFIER

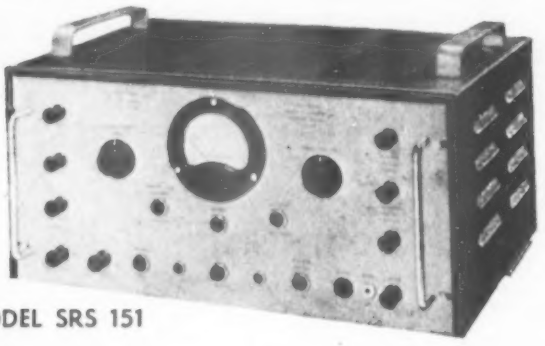
An amplifier capable of providing the closest approach to the original sound. Write for the Q.U.A.D booklet for full detailed specifications.

£35 *complete in two units as illustrated.*

ACOUSTICAL
MANUFACTURING CO LTD
HUNTINGDON • HUNTS • TEL: 361

SOLARTRON

REGULATED POWER SUPPLY



MODEL SRS 151

SPECIFICATION

D.C. OUTPUT: Continuously variable from 20-500 volts at 0-300 milliamperes.
RIPPLE VOLTAGE: 8 millivolts maximum.
INTERNAL IMPEDANCE: 3 ohms.
STABILISATION: 0.5% for a ± 10% change in mains voltage.
D.C. NEGATIVE OUTPUT: 0-170 volts variable and 170 volts fixed. ½ m.a max. current.
A.C. OUTPUT: Two outputs 6.3 volts 5 amps unregulated.
MAINS INPUT: 200-250 volts, 50 c/s.
PRICE: £104. Quick Delivery.

This instrument was developed to meet the stringent requirements of laboratories and test departments for a reliable and versatile power supply.

Features include ● Wide voltage and current ranges ● Low internal impedance ● Constant output with varying line voltage or varying load conditions ● Current or voltage levels indicated on 3½in scale meter ● High grade components including all paper type condensers ● Robust steel case with good ventilation.

Write for details of this and other high quality instruments to:

SOLARTRON

WIDE RANGE OSCILLATORS • VIDEO AMPLIFIERS • LABORATORY AMPLIFIERS • PULSE GENERATORS

SOLARTRON LABORATORY INSTRUMENTS LTD., 22 High St., Kingston, Surrey. KINGSTON 8981 P.B.X.

WEBBS RADIO FOR VARIETY OF STOCKS OF
COMPLETE APPARATUS AND INDIVIDUAL COMPONENTS
FOR THE PROFESSIONAL USER +
+ PHONE GERRARD 2089 FOR PROMPT SERVICE
=WEBBS RADIO 14 SOHO ST LONDON W1

First...

for all valve requirements

Most designers of electronic equipment contact Ediswan first for all their valve requirements. They know that amongst the large range of valves made by Ediswan they are almost certain to find the specific type they need. They are certain also that any valve made by Ediswan can be relied upon for satisfactory service. Why don't you contact Ediswan for your valve requirements next time?

EDISWAN

MAZDA

Valves and Television Tubes

The Edison Swan Electric Company, Ltd. 155 Charing Cross Road, London, W.C.2

Member of the A.E.I. Group of Companies

GARRARD
SWINDON

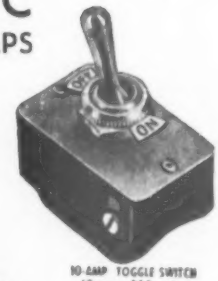
the name which helps to sell the Best Radio Grams

Throughout the Years . . . Throughout the World . . . Garrard has reigned supreme in producing Turntable Units of unsurpassed quality.

Manufacturers who use Garrard Units in their finest Instruments always mention them by name in their sales specifications.

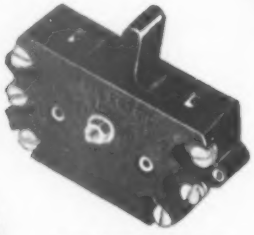
ARCOLECTRIC
SWITCHES & SIGNAL LAMPS

- For Industrial Equipment
- Domestic Appliances
- Electronic Instruments
- Automobile Switching

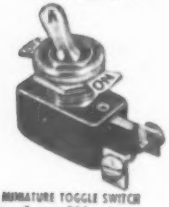


10-AMP TOGGLE SWITCH
10-amp. 250 volt.

PUSH PULL SWITCH
For Motor Cars



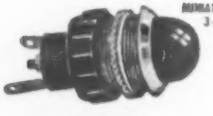
THREE POSITION TOGGLE SWITCH
Two-way and Off



MINIATURE TOGGLE SWITCH
3-amp. 250 volt.

D.P. TOGGLE SWITCH
3-amp. 250 volt.

PUSH BUTTON SWITCH
Consecutive Action

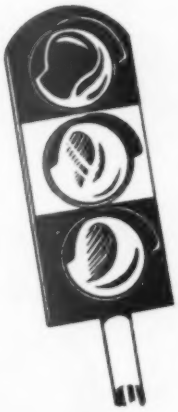


SIGNAL LAMP HOLDER
M.E.S. Fitting

Write for Catalogue No. 127-W

ARCOLECTRIC
SWITCHES · LTD

CENTRAL AVENUE WEST MOLESEY, SURREY · TELEPHONE: MOLESEY 4336 (3 LINES)



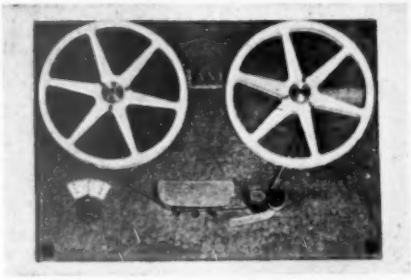
STOP

And Study the Reason Why

LANE

TAPE RECORDING EQUIPMENT

Gives that little More that Counts So Much

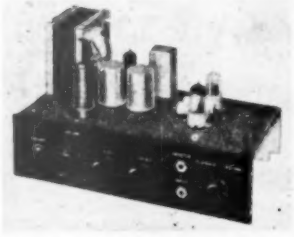


THE LANE TAPE TABLE

Three Motors to obviate friction drives, so often the cause of "wow" and "flutter" ● Fast forward and reverse rewind ● Rewind time under 1 minute ● High fidelity twin Track heads allowing approximately one hour playing from standard 1,200ft. spool of tape ● R.F. erase allowing one track to be erased without affecting the other ● Instantaneous braking to allow for easy cueing ● Only the Genuine Lane Tape Table Model 2A (Patents Pending) offers all these features at the low price of **£16.10.-**.

THE LANE TAPE RECORDER

Simple to use, the Lane magnetic recorder offers high quality recording at low cost ● Modern Miniature Valves used throughout ● Independent treble and bass controls ● 4 watts output ● Built-in speaker and outlet for extension speaker ● Backed by the "Lane" guarantee this superb recorder is offered complete with microphone, reel of "Scotch Boy" Tape and rewind spool at only **45 guineas.**



LANE AMPLIFIER

As used in the Lane Tape Recorder this amplifier is supplied as a kit complete with modern miniature valves and full working drawings at **£13.**

For those unable to build this amplifier it is also available built, tested and guaranteed at **£15.**

LANE OSCILLATOR UNIT

These units are constructed on a small chassis and provide variable r.f. for bias and erase.

OC.1 ERASE AND BIAS GENERATOR UNIT COMPLETE WITH VALVE

£3.10.0

TRADE ENQUIRIES INVITED

Write for Leaflet to:

VERDIK SALES LTD.

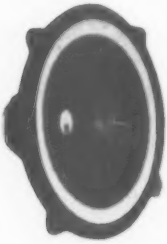
17 SHAFTESBURY AVENUE - LONDON - W.1

PHONE: GERRARD 8266

Be there every time!

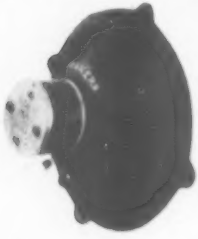
With a BAKERS Permanent Magnet LOUD SPEAKER

There is no surer way of obtaining true reproduction than by incorporating one of these speakers in your own cabinet, or by obtaining one of our Corner Cabinets, as illustrated below.



12" "TRIPLE CONE"
Frequency Range 18/16,000 c.p.s.
Fundamental Resonance — 35 c.p.s.
Max Peak Input — 12 watts
PRICE £6.10. plus £2.17.9. P.T.

£12.12.0 (No Tax) 18" "DUPLEX"
Frequency Range 20/16,000 c.p.s.
Fundamental Resonance — 40 c.p.s.
Max Peak Input — 30 watts



12" SINGLE CONE
Frequency Range 30/16,000 c.p.s.
Fundamental Resonance — 65 c.p.s.
Max Peak Input — 20 watts
PRICE £5.19.6 plus £2.11.0 P.T.

The "Selhurst" corner cabinet finished to customers requirements provides the perfect housing for all BAKER speakers.

PRICE £10.10.0 (No Tax)

BAKERS 'Selhurst' RADIO

Please write or full details to:—
24 DINGWALL ROAD, CROYDON, SURREY.

SIFAM ENGLAND

Precision INSTRUMENTS for the Laboratory

This Bench type portable instrument is used in many laboratories where consistent accuracy is demanded. Single or multi ranges for D.C. or A.C., calibrated to customers' requirements. Sizes 3½", 4" or 6" instruments. Accuracy B.S. First Grade.

Type M35. 4½" square

A First Grade B.S.I. moving coil, panel mounting instrument, supplied as D.C. Micro-Ammeter, Milliammeter, or Voltmeter. Also available as A.C. Voltmeter for frequencies up to 50,000 c/s A.C. Ammeter with internal transformer, or R.F. instrument with internal thermo-couple.

Thermaster

New Low Temperature Indicator

The most versatile instrument for temperature measurement in the range —80°C to + 200°C. Sensitive to rapid changes of temperature, to a high degree of accuracy hitherto unobtainable in any other form of temperature indicator. Sections of 20 degrees or more between maximum and minimum of instrument range can be spread over the 8" scale. Self-contained dry battery. Unaffected by voltage change or length of leads (which can be as long as required). Pencil type detector for surface contact, immersion, air or liquids.

Price £12.10.0

Complete with one element and 4ft. leads

● *Write for Catalogue No. S/11 giving full details of complete SIFAM range.*

SIFAM ELECTRICAL INSTRUMENT CO. LTD.
LEIGH COURT, TORQUAY Telephone: Torquay 4547-8

This is Britain's famous power amplifying tube...for years the favorite tube of experimenters and research laboratories, acknowledged in every country of the world to be the finest tetrode ever made. It is currently used in the Leak, Wilhamson, Radio Craftsmen and other fine amplifiers.
The KT66 is a versatile power tetrode with a number of useful applications. It may be used in the output stage of an audio-frequency power amplifier, either tetrode-connected for maximum sensitivity and power output or triode-connected for high quality working. In transmitting circuits using frequencies up to 30 Mc/s it may also be used as an oscillator or as a radio frequency amplifier.
A high slope, indirectly heated beam tetrode, the KT66 is suitable for either single or push-pull audio operation and may be employed as a beam tetrode with aligned grids. This alignment of the grids reduces losses in the screen and makes for the highest possible power conversion efficiency. With this system of construction high orders of power output may be obtained with a low screen dissipation, and the anode is designed to dissipate 25 watts continuously with a reliable life performance.
THE FINEST AUDIO TUBE EVER MADE!
KT66
DIMENSIONS
7-PIN "OCTAL"
Pin 1: Not connected
2: Heater
3: Anode
4: Screen Grid, g2
5: Control Grid, g1
6: Omitted
7: Heater
8: Cathode
View looking on underside of base.
All dimensions are in mm. and are the maximum except where otherwise stated.
RATINGS
Heater Voltage
Heater Current
Tetrode connected
Triode connected
6.3
6.3
OPERATING CONDITIONS
Single Valve A.F. Amplifier
Tetrode connected
Triode connected
Anode and Screen Voltage 250 400 250 volts
Bias Voltage -15 -38 -19 volts
Anode Current 85 63 60 mA.
Screen Current 6.3 — — mA.
Input Voltage 15 38 19 volts peak
Bias Resistance 160 600 315 ohms.
Anode Load Resistance 2200 4500 2750 ohms.
Distortion 9 7 6 %
Power Output 7.25 5.8 2.2 watts
Two Valves Push-Pull, A.F. Amplifier.
Tetrode connected, Auto Bias.
(Data per pair of valves unless otherwise stated)
Anode Voltage
Ventilation: Adequate ventilation around the bulb should be provided.
The circuit information given does not imply any licence under any patents which may be involved.
Anode Current 395 475 volts
Screen Current -40 -60 volts
Anode Dissipation, per valve 80 175 mA.
Screen Dissipation, per valve 3 19 mA.
Input Voltage, grid to grid 21 17 watts
Load Resistance, anode to anode 0.6 3.5 watts
Distortion 5000 80 volts
Power Output 5000 ohms.
† Stabilised screen supply voltage 5 %
50 watts.
BRITISH INDUSTRIES CORPORATION
164 Duane Street, New York 13, N. Y.

THE FAMOUS KT66 . . . IN USE ALL OVER AMERICA AND ACKNOWLEDGED TO BE THE FINEST BEAM TETRODE EVER MADE

IS AN Osram VALVE MADE IN ENGLAND

The photographic reproduction is taken from literature published in America by the British Industries Corporation and gives an entirely unsolicited tribute to this fine valve.

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

"IT'S ARRIVED!" says MAX BYGRAVES

★ STAR OF STAGE, SCREEN, RADIO AND TELEVISION

"AND TO PROVE IT," HERE IS THE:—

"MAYCO" PORTABLE TAPE RECORDER

PRICE £41 COMPLETE WITH CRYSTAL MIKE & TAPE. As illustrated
(READY TO USE) FULLY GUARANTEED

★ WE CAN BOAST THE FINEST REPRODUCTION OF ANY MACHINE.

★ THE LATEST TYPE "LANE" TAPE TABLE IS USED. 3 MOTORS. FULL BRAKING. FAST FORWARD AND REWIND, 45 SECS. APPROX. 1 HOUR'S PLAYING TIME. TWIN TRACK.
£16/10/- AVAILABLE SEPARATELY

★ THE RECORD/PLAYBACK AMPLIFIER IS OF A NEW DESIGN, WITH AUTO TONE CONTROLS ON RECORD, VARIABLE ON PLAYBACK. TWO INPUTS LEVEL INDICATOR. 4-WATTS OUTPUT
£14 (AVAILABLE SEPARATELY)

★ ROTHERMEL MIKE, £2/19/6 (AVAILABLE SEPARATELY) ★ SCOTCH BOY TAPE AND SPOOL 1200FT., £1/15/- (AVAILABLE SEPARATELY) ★ 2-COLOUR REXINE CABINET FOR ABOVE, £4/18/6 (AVAILABLE SEPARATELY).

CASH WITH ORDER ONLY

SEND S.A.E. FOR ACCESSORIES LIST

AVAILABLE ONLY FROM OR PHONE TERMINUS 5958 FOR APPOINTMENT

MAYCO ELECTRIC CO., 43 ROSEBERY AVENUE, LONDON, E.C.1.

Delco Power for AIRCRAFT

As a contribution to the rearmament programme GENERAL MOTORS LIMITED have made arrangements for DELCO motors for the Aircraft Industry and other special purposes to be manufactured at the FRIGIDAIRE DIVISION.

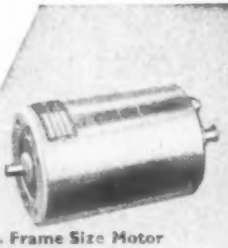
The Delco range of British-made motors, generators, rotary transformers etc. for aircraft is designed to provide power for a wide variety of ancillary equipment including electronic control gear and radio.

Design approval is held from the Ministry of Supply Director of Instrument Research and Development, for D.C. Aircraft Electric Motors.

Available motors include totally enclosed, fan ventilated flame-proof and immersed types built to meet users' requirements and the relevant M.O.S. specifications. All motors achieve maximum output with minimum weight and many variations of standard designs are regularly manufactured to meet individual demands.

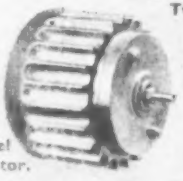
some typical applications . . .

★ SERVO DEVICES ★ FUEL PUMPS
★ GUN TURRET MECHANISM
★ BLOWERS ★ SCANNER DRIVES
★ DE-ICING EQUIPMENT
★ FOLLOWER DEVICES
★ HYDRAULIC PUMP DRIVES
★ VENTILATING FANS
★ CAMERA DRIVES
★ FLAP OPERATORS
★ RADIATOR SHUTTERS
★ BOMB SIGHT



2½" dia. Frame Size Motor
Two Pole—D.C.

3" dia. Frame Size Motor
Two Pole—D.C.



Immersed Fuel Boost Pump Motor.

All enquiries for

DELCO Reg'd Trade Mark **AIRCRAFT MOTORS**

To FRIGIDAIRE DIVISION OF GENERAL MOTORS LIMITED
STAG LANE · KINGSBURY · LONDON N.W.9 · Colindale 6541

it's what you can't see that counts

If you took an instrument from each of five manufacturers you'd find they all looked much alike. Maybe, here and there, a streamlining of design or a subtle positioning of a control, but in the main, a great similarity. It's the same with the specification of these units. All manufacturers use the same words and much the same phrases. How then are you to choose the best for your purpose?

We maintain, and our order books prove our point, that it's the stability and the quality of both basic materials and experienced craftsmanship in Marconi Instruments that give them their longer dependable, trouble-free life.

This is exactly what you want and Marconi Instruments will give it you. To make sure, check up on other firms who rely on them. They'll confirm our point that it's what you can't see that counts.

MARCONI INSTRUMENTS

SIGNAL GENERATORS · BRIDGES · VALVE VOLTMETERS
FREQUENCY STANDARDS · OUTPUT METERS · WAVE METERS
WAVE ANALYSERS · BEAT FREQUENCY OSCILLATORS

MARCONI INSTRUMENTS LIMITED · ST ALBANS · HERTFORDSHIRE

A Cordial Invitation to

HIGH FIDELITY

enthusiasts . . .

Even though you may NOT be contemplating buying any equipment at the moment—you are cordially invited to come along to the

BK

DEMONSTRATION ROOMS

229 REGENT STREET, W.1

(One minute from Oxford Circus—entrance in Hanover Street)

to hear for yourself in a friendly atmosphere what CAN be done in the field of modern high quality reproduction at a REASONABLE outlay. We have a competent technical staff and their sole duties are:

- ***To demonstrate the wide range of equipment available.***
- ***To give you any information you require.***
- ***To offer advice if you ask for it.***

They are at your disposal from 10 a.m. till 6 p.m. every day except Saturdays when we close at 12.30 p.m.

Drop in next time you're around!

AMONGST THE RANGE OF EQUIPMENT WE ARE DEMONSTRATING ARE . . .

All Equipment available on Hire Purchase Terms

The MAS QUALITY AMPLIFIER

A remarkable new unit with a flat frequency response from **25-20,000** c/s and a noise level **better than —80 d.b.**
It gives an output of 4.5 watts at .2% distortion (less than .1% at 3 watts).
Price **£13 10 0.** This will astound you when you hear it.

The "Williamson" AMPLIFIER

Audio Section now available as in separate unit to enable you to save money by building your own power unit. Price **£19 10/-.**
Power Supply Unit for above **£10 10 -.**
Both units professionally built, tested and guaranteed

B. K. PARTNERS LTD.

229 REGENT ST., LONDON, W.1

TELEPHONE: REGENT 1051

DIRECT T/V REPLACEMENTS

(REGD.)

Prop. **A. ROSE**, A.I.R.E.

134/136, LEWISHAM WAY, NEW CROSS, S.E.14.

TIDEWAY 3696

T.V SPARES MANUAL. If you have not yet had your copy, send **6d.** stamps today.

EXTRACTS FROM OUR LIST

Ekco: TS46 line output transformers	£1	1	6
TS46 scan coils	£1	18	6
TS46 E.H.T. osc. coils	£1	0	3
G.E.C.: Germanium crystals GEX 35/0		10	6
Germanium crystals GEX 03		8	6
Germanium crystals GEX 44/1		8	0
Germanium crystals GEX 34		6	6
H.M.V.: 1807a line output transformers	£2	6	0
1807a line osc. transformers		14	0

All prices include packing and postage. Goods can be sent C.O.D. or C.W.O.

TECHNICAL BOOKS

"Advanced Theory of Waveguides," by L. Lewin. Post paid	£1	10	7
"Radio Interference Suppression," by G. L. Stevens, A.M.I.E.E. Post paid		10	11
"Sound Recording and Reproduction," by J. W. Godfrey and S. W. Amos. Post paid	£1	10	7
"Television Receiving Equipment," by W. T. Cocking, M.I.E.E. Post paid		18	9
"The Oscilloscope Book." Post paid		5	6
"Television Faults," by N. Stevens. Post paid		5	6
"Television Receiver Practice." Post paid		5	6
"T/V Fault Finding." Post paid		5	6
"Television Servicing Manual." Post paid		5	0

SPECIAL OFFER

Complete set of the last five books plus "DIRECT T/V REPLACEMENT MANUAL," making a total of 430 pages on latest T/V technique for **25/-.** THIS IS AN IDEAL CHRISTMAS GIFT.

"Tyana" Light Weight Soldering Iron, adjustable bit, weight approx. 4 oz. Heating time 3 minutes. Standard voltage range. Price **17/6**, including postage.

FOR GREATEST EFFICIENCY AT THE HIGHER FREQUENCIES

SILVERED JAY CERAMIC

PRECISION CAPACITORS

FOR TELEVISION, F.M., AND ALL U.H.F. APPLICATIONS

Constructors', service replacement, and all kit types.

High precision and laboratory types.

INQUIRIES INVITED

Sole Export Agents:—

Messrs. ANTEX, 5, TOWER HILL, LONDON, E.C.3.

JAY DEVELOPMENTS,
HEATH LANE, WEST BROMWICH.
Tel.: STO 2294.

Designed for Critics—by Critical Designers

THE

MUSIC MASTER

TAPE DESK

The MUSIC-MASTER tape desk is a *precision engineered* TWO-SPEED tape mechanism, having the performance and features normally associated only with infinitely more expensive machines.

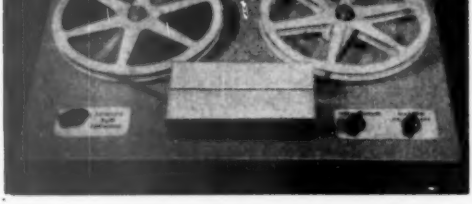
The MUSIC-MASTER is the outcome of two years' development and research into the problems connected with tape mechanisms in general, and into the problems presented in the manufacture of a precision instrument in particular. The resultant product more than justifies the care and attention it has received, not only in design, but also in production.

The MUSIC-MASTER employs three motors of special design, thus eliminating clutch and friction drives, and the consequent possibility of erratic operation due to the wearing of such components. At all times the motors are operated well within their "continuous operation" ratings, giving complete reliability, cool running and freedom from mechanical noise. The mechanism will handle the tape at high speed in both directions, and has a rewind time of less than 50 seconds for a full 1,200ft. reel of tape. The braking system is simple and positive, and the tape may be stopped while running fast forward or rewinding, without any danger of "spilling."

For operating convenience the MUSIC-MASTER is unsurpassed. Once the tape spools are in position, and the tape dropped into the simple straight slot in the tape gate, it does not have to be handled until it is required to change reels. Fast forward and rewind operations are accomplished without the tape being touched by hand. The speed change system is instantaneous, and the tape speed may be changed while the machine is running or stationary.

The MUSIC-MASTER tape desk is fitted with two high-fidelity high impedance half track width heads. The use of high impedance heads simplifies amplifier design, and at the same time eliminates the use of a matching transformer, and consequently reduces the risk of hum pick-up during play-back.

The MUSIC-MASTER tape desk is fully guaranteed for 12 months against defective materials or workmanship, and a written warranty is issued with each machine.



	MODEL A	MODEL B
Tape Speeds	15in. & 7½in./Sec.	7½in. & 3¾in./Sec.
Track Width	0.1in.	
Number of Tracks	Two	
Rewind and Forward Time	50 secs.	
Playing Time Total	½ hr. & 1 hr.	1 hr. & 2 hrs.
Top Frequency	17 kc/s-10 kc/s.	10 kc/s.-5 kc/s.
Bias and Erase Frequency	45-55 kc/s.	
Consumption	45 watts.	
Cyclic Speed Variations	0.25% max.	
Loading	Single Slot.	
Motors	Three	
Dynamic Range	Better than 60 db.	
Supply Voltage	200-250 v. A.C. ONLY.	
Top Plate	16¼in. × 11¼in.	

Each MUSIC-MASTER tape desk is supplied with complete operating instructions, and a recommended circuit enabling optimum performance to be secured.

THE **MUSIC MASTER** TAPE DESK *MODEL A OR MODEL B* **£15.15.0**
(Carr. & Pkg. 5/- extra)
Delivery Ex-Stock

DEMONSTRATIONS

We shall be pleased to demonstrate equipment—without obligation—to callers at our Hounslow Showroom.

EXPORT

An expert packing department specialises in prompt despatch by air or sea of all overseas orders.
Export enquiries receive immediate attention and your enquiries are cordially invited.

The above product is only obtainable direct from the manufacturers.

TRUSOUND LTD.

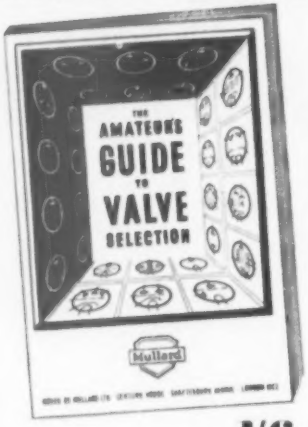
Manufacturing Electronic Engineers.

OFFICES & SHOWROOM: **196, Kingsley Road, Hounslow, Middx. Telephone: HOUnslow 7947.**

WORKS: **Willesden, London, N.W.2.**

(All orders and enquiries should be sent to the offices as above.) Terms of business: remittance with order only.

EVERY AMATEUR CONSTRUCTOR NEEDS THIS new BOOK



For the first time Mullard have compiled a Valve and C.R.T. reference specially for the amateur constructor. "The Amateur's Guide to Valve Selection" contains essential information on valves for AC, AC/DC and battery operated radio receivers, for television receivers, and for audio amplifiers:

1. Instructions for the correct use of the Mullard "Preferred" Range of Valves and of Mullard "Long Life" Television Picture Tubes.
2. Full operational data for each application.
3. Simple valve selection table for quick reference.
4. Mullard Valve and C.R.T. nomenclatures.
5. Typical circuit diagrams for the various applications.

Mullard

1/6

Per copy (packing & postage 3d. extra).

OBTAINABLE FROM YOUR LOCAL DEALER, OR DIRECT FROM MULLARD LTD., BY FORWARDING YOUR NAME AND ADDRESS, TOGETHER WITH A 1.9 P.O., TO THE ADDRESS BELOW.

MULLARD LTD., VALVE SALES DEPT., CENTURY HOUSE, SHAFTESBURY AVENUE, LONDON, W.C.2.

MVS-218

HIGH VOLTAGE EQUIPMENT

3,000—90,000 volts

A.C. and D.C.

IONISATION TESTERS

300-30,000 volts

★ The specimen at true earth.

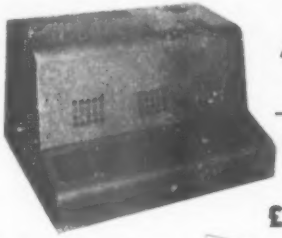
★ Visual indication of ionisation by meter and oscilloscope.

Write for full details to:

HIVOLT LTD

34A, POTTERY LANE, LONDON, W.11

Telephone: Park 6955-5237



A MODERN AC/BATTERY AMPLIFIER

—AT A KEEN PRICE

THE GRAMPIAN Type 524 15 watt Amplifier, for use on 130/260 volts A.C. mains and 6 volt Battery

LIST PRICE

£38 - 0 - 0

Combining all the following advantages. Separate input controls for Microphone and Gramophone. Change over switch for mains or battery supply. Stand by switch to reduce battery consumption. Separate bass and treble tone controls. Choice of output impedances for one or two 15 ohm loud speakers.

ALSO AVAILABLE AS THE GABE PORTABLE OUTFIT

The case when separated forms the two loud speakers: moving coil, pressure operated type microphone with slide action on/off switch and desk type stand provided.

Price complete **£58** (TAX FREE)

For full details write to:

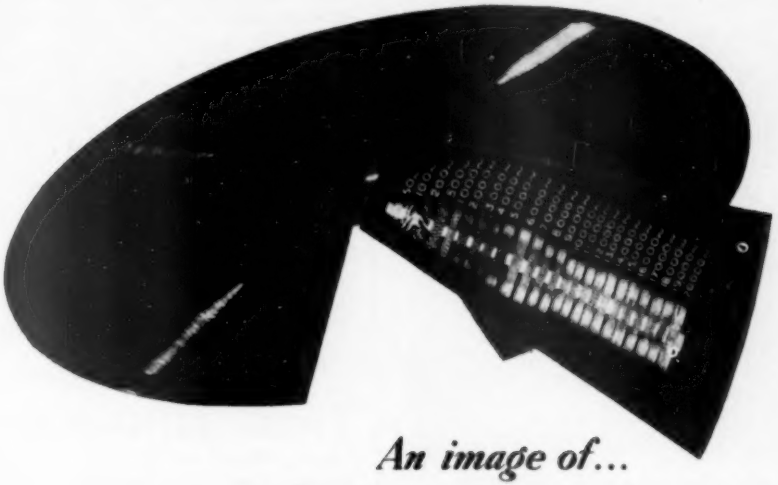
GRAMPIAN REPRODUCERS LTD

9 HANWORTH TRADING ESTATE, FELTHAM MIDDX.

Phone: Feltham 2657 *Grams: Ampam, Feltham*

22562

What do you demand of a DIRECT RECORDING DISK No 2



An image of...

WIDE FREQUENCY RESPONSE

50 c/s to 20 Kc/s

Microphones, amplifiers, cutterhead—all working together as a perfectly balanced team, the stylus faithfully responding, the swarf trailing safely away leaving a cutting capable of . . . what ?

Maybe a faithful re-creation of the original sound, or maybe a mere travesty of it. It all depends upon the disk coating. To permit of faithful recording the coating must conform to a very exacting degree of consistency—it must be "soft" enough to prevent damping stylus movement (and thereby attenuating frequency responses), yet it must also be "hard" enough to provide a clean, well-defined groove that will stand up to the exacting demands of processing* or repeated playbacks. This is a fair description of the qualities of the exclusively formulated M.S.S. cellulose—nitrate lacquer used for coating all M.S.S. disks. There is yet another outstanding characteristic of M.S.S. disks, namely that of a negligible noise level. This results not only from the special constituents of the lacquer itself but also from the truly exhaustive processes of repeated filtration to which the coating is subjected.

* Even when cut at high stylus velocities, M.S.S. disks are conspicuously free of 'horns' and 'hangnails' at the groove edges—a very valuable asset in 'microgroove' recording.

M.S.S. disks are available in four grades which cover every recording requirement. Write for details and full technical information.

THE MASTER SOUND SYSTEM

M.S.S. RECORDING CO. LIMITED, POYLE CLOSE, COLNBROOK, BUCKS.
Colnbrook 284

THE *Reflectograph*

MAGNETIC TAPE RECORDER

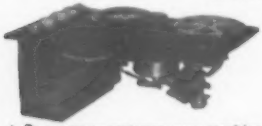
(Fully covered by patents)

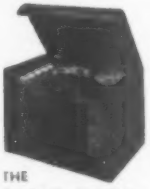
EXCLUSIVE TAPE DRIVE. The new type tape drive exclusive to the Reflectograph permits tape speed to be set with positive accuracy to *any* fixed value. This Reflectograph feature is especially valuable during peak hour loading, or in areas where supply voltage is below normal, as ***recordings or playback can still be carried out at the standard speed of 7½ in. per second!***

Tape speed set by calibrated meter, ***independently of input mains voltage*** ● Any speed between 3in. and 8in. per second can be selected and locked ● Entirely new type of capstan drive ● Fully automatic spool brakes ● Differences in mains voltages between the recording and playback functions are cancelled by re-setting the tape speed to the original recording speed.

★ *See and hear it yourself at London Showrooms, 229 Regent Street, W.1.*

CONSOLE MODEL ..... 99 gns.
TABLE MODEL ..... 83 gns.
(Above prices do not include microphone.)
MATCHED RADIO UNIT for either model £10
Plus P.T.





THE TABLE MODEL

★ *To our many customers now awaiting delivery of the new Recorders we must offer our sincere apologies. The delay—due to heavy export commitments and the unprecedented demand for this new equipment—will be kept as short as humanly possible.*

Illustrated folder from

RUDMAN DARLINGTON (ELECTRONICS) LTD.

Designers and manufacturers of Magnetic Recording Equipment.
LICHFIELD ROAD · WEDNESFIELD · STAFFS
Phone: Wolverhampton 31704

ALSO AVAILABLE

The Alpha Unit comprising Tape-Drive mechanism and Record/Playback Amplifier assembled together as one unit. This Combined Chassis is the "heart" of the Reflectograph Recorder. Price £69/18/6.

2304

HIGH FIDELITY AMPLIFIERS

Williamson, Model D	£31 0 0
Junior de Luxe	£20 0 0
Baby de Luxe	£12 10 0
Minor	£11 10 0
Junior de Luxe, single chassis version	£26 10 0
Williamson Pre-Amplifier/Tone Compensation Unit	£10 7 6
Junior Pre-Amplifier — incorporating low pass filter. (May be used with either the **Junior** or **Baby** Main Amplifiers)	£8 10 0
Baby de Luxe Pre-Amplifier	£5 10 0

Detailed specifications of all the above units available post free on request.

Available through leading dealers in London and the Provinces, or if in any difficulty apply direct.

Trade and Export Enquiries invited.

ROGERS DEVELOPMENTS CO

"Rodevco House," 116 Blackheath Road, Greenwich, London, S.E.10. Telephone: TIDeway 1723

PRIVATE

OPINIONS

". . . it is everything you say, in fact even more; on every range it is accurate . . . after about half an hour from receiving it I had it working."—A. P., Longton.

". . . I am very pleased with kit . . . specially the instructions—so clear!"—K. T., Cleethorpes.

". . . I felt I had to write and congratulate you for putting on the market a R/C bridge of such high accuracy at a phenomenally low price. Construction is remarkably easy . . ."—D. G. R. L., Cheam.

". . . I am very pleased with same and think it remarkably good value for such low cost . . ."—W. E. C., Hove.

". . . when one of your bridges was tried out against Laboratory Standards and everyone present was amazed at the very high degree of accuracy . . ."—J. R., Pulham.

THE RADIO MAIL 30/- RES./CAP. BRIDGE KIT IS THE BEST RADIO VALUE OBTAINABLE TO-DAY

5 megohms—50,000 ohms	50 mfd.—.2 mfd.
100,000 ohms—1,000 ohms	1 mfd.—.01 mfd.
1,000 ohms—10 ohms	.01 mfd.—.0005 mfd. (500 pF.)

NO CALIBRATING. An accurately calibrated panel with each kit.

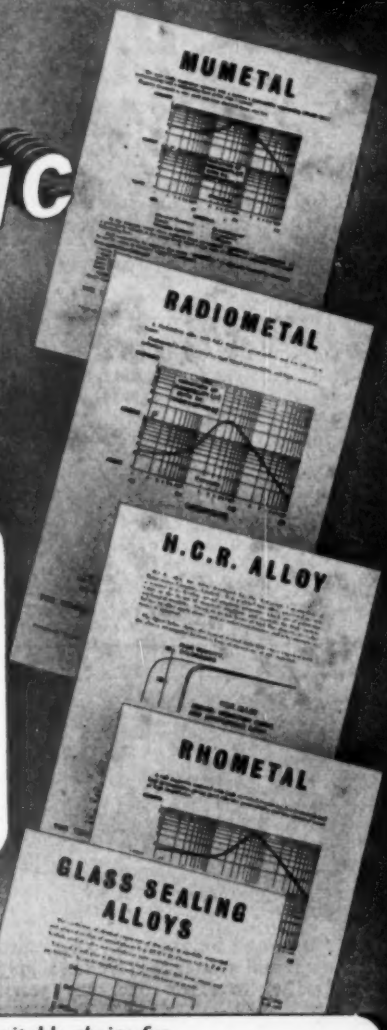
NEW COMPONENTS. Specially selected for accuracy.

EASILY ASSEMBLED. Instructions, circuit and diagrams.

Part post & packing 1/6. Cash with order or C.O.D.

RADIO MAIL, 4, RALEIGH ST., NOTTINGHAM. Stamp for list and with all enquiries, please

TELCON MAGNETIC ALLOYS



Telcon magnetic and special purpose alloys are used in a vast and ever expanding field of industrial and electrical applications.

It is almost certain that a Telcon Metal exists to meet your specific needs, but if not, we will gladly co-operate with you in finding the answer to your particular problem.

All Telcon Metals are subject to the most rigorous control and repeated inspection, and this ensures the highest standards of reliability.

The reputation of many world-famous products is solely dependent upon the utilisation of Telcon Metals.

The inevitable choice for

MAGNETIC CIRCUITS IN INSTRUMENTS OF ALL KINDS INCLUDING: CURRENT & VOLTAGE TRANSFORMERS, COMMUNICATION TRANSFORMERS, RADIO FREQUENCY, RADAR & T.V. TRANSFORMERS, BRIDGE MEASUREMENT TRANSFORMERS, SPECIAL REACTORS, INDICATING INSTRUMENTS, RELAYS, MAGNETIC AMPLIFIERS, GALVANOMETER, WATTMETER, C.R.T. AND TRANSFORMER MAGNETIC SHIELDS, PICK-UP DEVICES, REGULATORS.

Complete technical data on the full range of Telcon alloys is available to designers and manufacturers on request.

THE TELEGRAPH CONSTRUCTION & MAINTENANCE CO LTD

Head Office: 22 OLD BROAD ST., LONDON, E.C.2 Telephone: LONdon Wall 7104

All enquiries to: TELCON WORKS, GREENWICH, S.E.10 Telephone: GREenwich 3291

TELCON

A.D.S.
SUPER QUALITY
8½ WATT AMPLIFIER
FOR A.C. MAINS ONLY

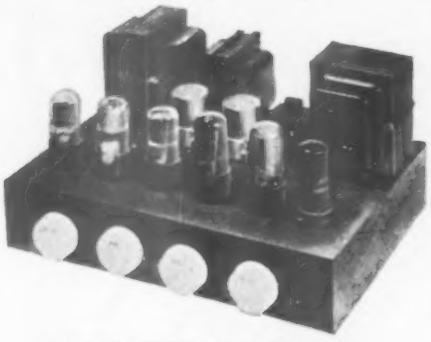
Push Pull 6V6s 15 db neg. feed back 25-18,000 cps ± 1 db Hum Level — 80 db at 6½ watts. Bass boost — Treble boost and cut : LP correction : Provision radio feeder unit.

BUILT & TESTED £15.0.0

A.D.S. REFLEX CABINETS
Veneered and French Polished. Available in Walnut, Oak and Mahogany.
12" MODEL £9.19.6
10" MODEL £9.9.0

WALNUT CORNER CABINET
FOR 10" and 12" SPEAKERS.
£12.12.0

DEMONSTRATIONS DAILY



SUPERHET FEEDER
Three wavebands — B8A Valves. 7 ks band width.
Wired complete and Tested.
10 gns.
FULLY GUARANTEED

ALEC Davis SUPPLIES Ltd.
MUSEUM 4539 MUSEUM 2453
(Dept. W.W.), 18, TOTTENHAM COURT ROAD, LONDON, W.1.
Shop Hours : Monday to Friday 9-5.30 p.m. Saturdays 1 p.m.

SHORTAGE OF RADIO & T/V ENGINEERS

The demand of Industry for our trained students is still greater than we can supply —and is likely to remain so for many years.

We offer:
FULL TIME DAY COURSE
1 year course in Principles and Practice of Radio and Television.

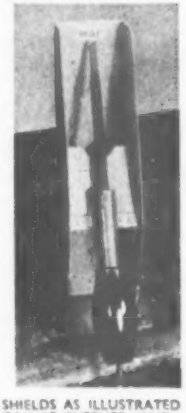
Next Course commences 14th April, 1953.
Write for FREE BROCHURES giving details of the above, of our 3-year course, and of others.

E.M.I. INSTITUTES—the only college which is part of a great industry.

E.M.I. INSTITUTES
(DEPT. 10A), 10, PEMBRIDGE SQUARE, LONDON, W.2. TEL. BAYSWATER 5131/2
Associated with "H.M.V." MARCONIPHONE COLUMBIA ETC
E.A.1B

ADCOLA
(Regd. Trade Mark)

SOLDERING INSTRUMENTS



SHIELDS AS ILLUSTRATED CAN BE SUPPLIED WHEN AVAILABLE

SOUND Joints For SOUND Equipment
Any volt range supplied 6.7 to 230 250

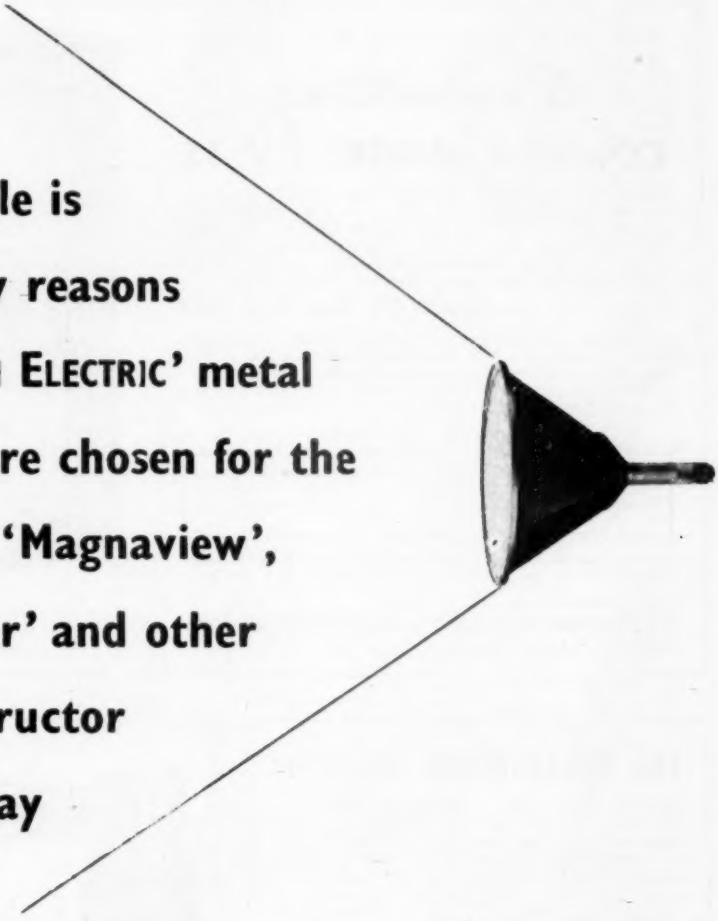
- ⅛" dia. bit Standard Model
- ¼" dia. bit Standard Model
- ⅛" Detachable Bit Type (Factory Bench Unit)
- Equally suited to daily or intermittent use
- Heating time: 90 seconds
- Consumption: 25 watts
- Weight: 4 ozs
- Total length of instruments: 9 inches
- Handle remains cool during operation

Made in England
Registered Design (British U.S.A., Foreign Patents)
Export Enquiries invited.

● *Apply Sole Manufacturers and Suppliers*

ADCOLA PRODUCTS LTD.
S.I.s, Offices & Works: CRANMER COURT, CLAPHAM HIGH ST, LONDON, S.W.4. MACaulay 4272

The wide viewing angle is one of many reasons why 'ENGLISH ELECTRIC' metal C.R. tubes are chosen for the 'Tele-King', 'Magnaview', 'View-Master' and other home constructor circuits today



The 'Tele-King', 'Magnaview', 'View-Master' and other circuits for home construction have all been designed to take advantage of the 'ENGLISH ELECTRIC' T901 Metal C.R.T.—the tube to fit if you want "professional" results.

- ★ *Magnetic focus and deflection (70° angle)*
- ★ *Almost flat face plate.*
- ★ *Wide viewing angle and picture-focussing over the whole screen area.*
- ★ *Fitted with Ion trap.*
- ★ *Robust yet lightweight construction.*
- ★ *Overall length 17⅛".*

For full information on the T901, including scanning, write to:
The ENGLISH ELECTRIC Co. Ltd., Television Department, Queens House, Kingsway, London, W.C.2

'ENGLISH ELECTRIC'
Metal C.R. Tube

22 Years' unrivalled experience and careful design has resulted in the . . .

Armstrong

CONSOLE MODEL T.V. 15

The set, incorporating a 12in. C.R.T. and 10in. Loudspeaker, operates on A.C. Mains 200/250 v., is now available in a beautifully veneered two-tone walnut cabinet 35in. high 20in. wide 20½in. deep. There are two main controls, sound volume and picture brightness, situated on the front of the cabinet and the usual pre-set controls are on the side.

PRICE 63 Gns. Tax Paid

The usual ARMSTRONG GUARANTEE "Purchase money refunded in full if dissatisfied" is in force and a Comprehensive Maintenance Scheme is available to cover replacement C.R.T. and Valves. Installation in the home is free and erection of aerial can be arranged at moderate cost.

H.P. TERMS AVAILABLE

OTHER MODELS IN THE ARMSTRONG RANGE include :

MODEL EXP. 125/3 14-valve all-wave Radiogram chassis. A.C. Mains £36.15.-, plus P.T.

MODEL RF.104 10-valve all-wave Radio chassis. A.C. Mains. £34.-.-, plus P.T.

MODEL EXP. 73 8-stage all-wave Radio chassis. A.C. Mains £17.15.-. Plus P.T.

Demonstrations at our Holloway Demonstration Room, daily until 6 p.m., Sats., 5 p.m.

For further details write to :

ARMSTRONG WIRELESS & TELEVISION CO. LTD.

Warlters Road, Holloway, London, N.7. :: :: :: *Telephone :* **NORTH 3213-4**

The Armstrong Console Model T.V. 15

The WILLIAMSON Amplifier

We have been given a laboratory report of a Williamson Amplifier, our type GW18.C, which was submitted to intermodulation tests. The results using an Altec Lancing Intermodulation Distortion Meter and Boonton Beat Frequency Oscillator were :—

I.M. Distortion	Power Output	Frequency Ratio 1 : 4
2%	15 watts	40 & 2,000 c/s.
0.3%	10 watts	40 & 2,000 c/s.
0.9%	15 watts	100 & 2,000 c/s.
0.2%	10 watts	100 & 2,000 c/s.

This is the first time to our knowledge, Intermodulation Distortion figures have been published in this country and compared with similar American amplifier data they are considerably lower than those for any other type.

The report on the Goodsell pre-amplifier showed it to be a comparable unit with similar figures.

Write for details of our new Tape Deck Pre-Amplifier Unit for use with our amplifiers.

Demonstrations at :—

Webb's Radio, 14, Soho Street, London, W.1.

The Classic Electrical Co. Ltd., Lr. Addiscombe Rd., Croydon.

GOODSELL LTD.,

40, Gardner Street, Brighton

Tel. Btn. 26735

ALWAYS "FIT"

AUTOSET

CASTORS

THE WORLD'S BEST

CONTRACTING TUBE ADAPTOR

For ⅞", 1", 1¼", 1½" tubes. Quickgrip Adaptors are fitted by hand as no tools are required. 2", 2½", 3" and 4" wheels may be used.

Ask for Brochure *and pages 8, 25, 57.*

Numerous other types of hood fittings available.

Engineers, Patentees and Sole Manufacturers

AUTOSET (PRODUCTION) LTD.

DEPT. "H," STOUR STREET, BIRMINGHAM, 18

EDG 1143/41 Estd. over 30 years

Please mention "Wireless World"

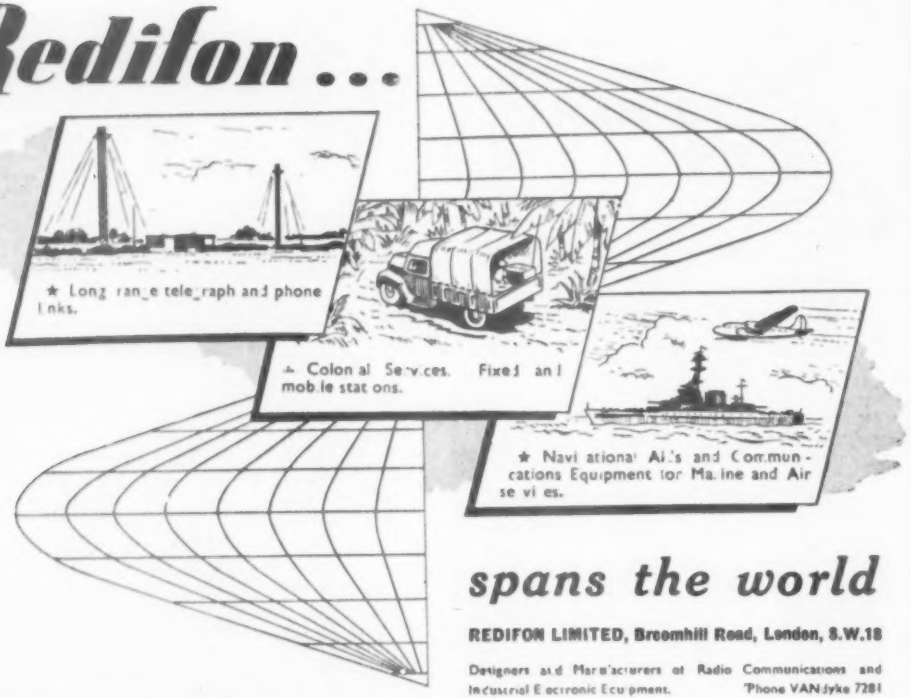
for radio ceramics

STEATITE & PORCELAIN PRODUCTS LTD.

Stourport-on-Severn, Worcestershire. Telephone: Stourport 111. Telegrams: Steatain, Stourport

SP88

Redifon...


★ Long range telegraph and phone links.
★ Colonial Services. Fixed and mobile stations.
★ Navigational Aids and Communications Equipment for Marine and Air services.

spans the world

REDIFON LIMITED, Broomhill Road, London, S.W.18

Designers and Manufacturers of Radio Communications and Industrial Electronic Equipment. 'Phone VANdyke 7281

CONSOLES

For Major Film Mixer Suites to Individual requirements

"VIEWMASTER" CONSOLES

AS SHOWN

Beautifully designed and finished in Walnut, Oak, Mahogany and Teak, to customers requirements

Standard "VIEWMASTER" model as shown **£13.0.0**
With Full Length Doors **£14.0.0**
Universal Model for all 16" tubes now in preparation.
Carriage and Packing 15/- extra.

Fitted with shelf for easy mounting. These are **NOT** mass produced and dimensions can be altered to suit personal requirements.

Individual and Trade Enquiries to:

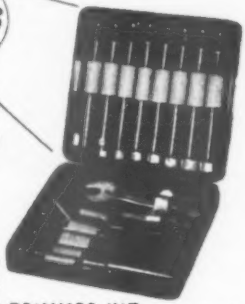
H. ASHDOWN

CABINET MAKER

98 HERTFORD ROAD, EDMONTON, N.9

Phone: TOT 2621

ONLY **25/6** POST FREE



A ***workshop*** in your ***pocket!***

THE TELEVISION AND RADIO SERVICE ENGINEER'S **MASTER** TRIMMER KIT

The Ideal Christmas Gift

Contains:

1 End Trimmer.
1 Side Trimmer.
1 Yaxley Switch Contact Adjuster.
1 Low Capacity Trimmer.
1 Screwdriver.
1 Set of Feeler Gauges.
1 Set of Box Spanners from 1 to 4 B.A.
1 Set of Box Spanners from 0 to 5 B.A.

In durable black crackle finish metal case.

Export enquiries invited

SEND YOUR ORDERS TO:

J. & S. NEWMAN LTD.

100 HAMPSTEAD RD., N.W.1
Tel.: EUSton 5176/7

VALVE VOLTMETER E7555

The E7555 provides an accurate means of measuring a wide range of resistances and a.c. and d.c. voltages. Special design features result in a high input resistance, and negligible zero drift on both range changing and mains variations.

Voltage Range: A.C.: 3V, 10V, 30V, 100V, full scale at frequencies up to 30 Mc/s. 300V, 1,000V, 3kV, 10kV, full scale at frequencies up to 10 kc/s.

D.C.: Positive or negative 3V, 10V, 30V, 100V, 300V, 1kV, 3kV, 10kV, full scale.

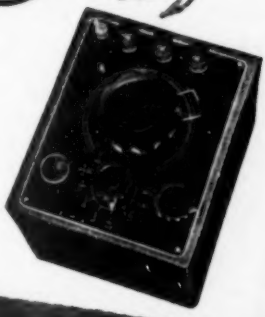
Resistance Range: 20Ω, 200Ω, 2kΩ, 200kΩ, and 2MΩ, centre scale.

UNIVERSAL MEASURING BRIDGE GM4140/1

Extremely robust and easy to operate, this instrument is designed for the rapid measurement of resistance and capacitance to an accuracy of ±2% on all ranges except the megohm ranges, where its accuracy is ±5%. Provision is made for the use of external standards when any two similar impedances can be compared, and it is also possible to use the balance indicator separately to detect signals of one millivolt and upwards.

Resistance Range: Using internal standards: 0.1-10Ω, 10-1,000Ω, 1-100kΩ, 0.1-10MΩ.

Capacitance Range: Using internal standards: 10-1,000μμF, 1,000μμF-0.1μF, 0.1μF-10μF



Mullard

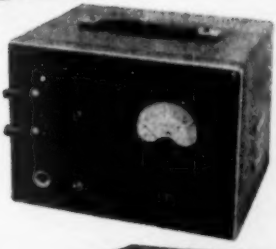
ELECTRONIC INSTRUMENTS

HIGH VOLTAGE POWER SUPPLY UNIT E7571

This instrument provides a variable voltage, e.h.t. power source in a compact, lightweight form. A h.f. oscillator is used to produce the high voltage, thus eliminating the need for a mains transformer. The E7571 may be used as a source of high voltage for cathode ray tubes; as a simple h.v. breakdown tester; or as source of h.v. energy in nucleonics.

Output Voltage: Continuously adjustable from 5 to 10 kilovolts (no load). The exact voltage is shown on a built-in meter.

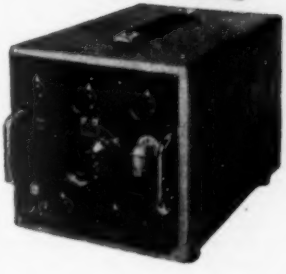
Output Power: 5 watts approximately.



F.M. SIGNAL GENERATOR E7572

This Signal Generator is designed for the measurement of f.m. receiver characteristics operating in the 90Mc/s v.h.f. broadcast band.

Carrier Frequency	R.F. range 80-104 Mc/s. Accuracy ±1%. I.F. range 2-20 Mc/s.
Modulation	Sinewave: Frequency 500c/s. Deviation variable 0-100 kc/s. Sawtooth: Frequency 100c/s. Excursion 500 kc/s (peak to peak).
Output Voltage	Continuously variable 1μV to 0.1V. Accuracy ±2dB.
Output Impedance	75 ohms.



Full technical information on these and other Mullard Electronic Instruments is available on request.

Mullard

MULLARD LTD., EQUIPMENT DIVISION, CENTURY HOUSE, SHAFTESBURY AVENUE, LONDON, W.C.2

NORTHERN AGENT:
F. C. Robinson & Partners, Ltd.,
227 Deansgate, Manchester, 3

SCOTTISH AGENT:
Land, Speight & Co. Ltd.,
73 Hanover St., Glasgow, C.2

MIP

Manufacturers of Ammeters, Voltmeters, Ohmmeters, Watt-meters and frequency meters for switchboard or portable use.

MULTI-RANGE TEST SET SERIES 100

The Universal testing set for Service Engineers. Sensitivity 10,000 ohms per volt. Strong metal case with carrying handle, complete with leads having detachable bulldog clips and test prods. Size 9 x 5½ x 4 ins.

MEASURING INSTRUMENTS (PULLIN) LTD.
Electrin Works, Winchester Street, London, W.3
Tel.: ACOrn 4651/3 and 4995

RANGES

AC/DC VOLTS: 10, 25, 100, 250, 500, 1,000.
DC MILLIAMPS: 2.5, 10, 25, 100, 500.
AC/DC MICROAMPS: 100 Microamps 10v range.
RESISTANCE RANGES: 0/1 Meg (13,500 ohms mid-scale) 0/10,000 ohms (135 ohms mid-scale).

The

"TELEMAX" LONG RANGE 50-μ/volts

BIG PICTURE 4' x 3'

23 valve s/h. circuit. Sensitivity better than 50 microvolts. Full bandwidth. 4'×3' picture. 5 channel facility. A.C. only. Insulated chassis. Neutral coloured rexine covered case, size approx. 25"×22"×21", fitted with castors and geared lifting jack for tilt. Complete with valves, c.r.t. and optical unit.

Detailed Specification from the Manufacturers:—

TELEMECHANICS LTD.
3 NEWMAN YARD, NEWMAN ST. LONDON, W.1 *LANgham* 7965

S. G. Brown

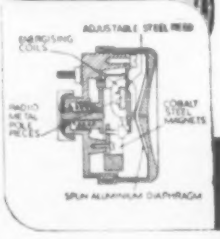
"A" TYPE HEADPHONES

The first choice of RADIO OPERATORS throughout the world

These headphones feature a High Permeability Reed tuned to 1,000 c/s. and coupled to a conical aluminium diaphragm. Earpieces individually adjustable while in use for sensitivity and power-handling characteristic.

D.C. Resistance: 4,000 ohms.
Impedance: 16,000 ohms at 1,000 c/s.

The S.G. Brownrange of headphones covers types for many specific requirements. Details of the full range are available in the illustrated Brochure "A"—sent on request



S G Brown Ltd
SHAKESPEARE ST. WATFORD, HERTS
Telephone: Watford 7241

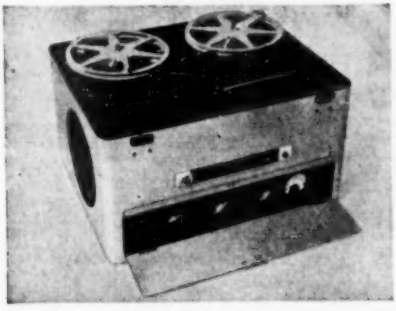
11

Patience pays...

The old copy-book adage "Patience is its own reward" sounds strangely out of place in days when bustle and impatience are lauded as virtues. Nevertheless, those who have preferred to wait for a Ferrograph rather than accept something other than the best, have found how much truth lies in the old saying.

Increased production facilities, initiated primarily to meet the priority requirements of the Services, have resulted in an increase in the number of instruments available to Industry, Educational Authorities, Scientific and Research Establishments, etc., etc.

Attention is accordingly directed to the abridged specification of our recorder instrument Type "YD", and although material restrictions will continue to prevent us satisfying all demands with the promptness we would wish, the delivery position has improved to an extent where reasonable dates can now be quoted.



★ **"FERROTAPE" NOW FREELY AVAILABLE 1,200 feet £2.5.0: 600 feet £1.6.0: 200 feet 12/6d.—all on anodised aluminium reels with patent "Hublok" centre.**

FERROGRAPH TYPE "YD"

SUPPLY VOLTAGES
100-120 volts and 200-250 volts A.C. 50 c.p.s. (60 c.p.s. by special pulley).

RECORDING MEDIUM
WW372/49 Ferrotape on reels of 1200 ft., coating inside.

TAPE SPEEDS
7½", 3¾", and 1⅞" per sec.

TRACK WIDTH
0.1" displaced to one edge.

NUMBER OF TRACKS
2 side by side.

RUNNING TIME (50 c.p.s. supply)
30 mins. each track at 7½" p.s. total 1 hour per reel, pro rata for other speeds.

REWIND TIME (and wind-on)
Less than 1 min. for full reel.

FREQUENCY RESPONSE (WW372/49 Ferrotape)
(a) At 7½" p.s. 70—10,000 cycles ± 3 db.
(b) At 3¾" p.s. 70—4,000 cycles.
(c) At 1⅞" p.s. 70—2,000 cycles.

INPUT IMPEDANCES AND LEVELS
(a) *Line Input.* — 600 ohms. Balanced.
(b) *Microphone Input.* —1 megohm unbalanced, or using external plug in matching transformer, 25 ohms. Balanced.

OUTPUT IMPEDANCES AND LEVELS
(a) *Main Output* — 600 ohms. Balanced.
(b) *Monitor Loudspeaker* — 1 watt to internal 5" speaker.

SIGNAL TO NOISE RATIO
(a) In the range 200-10,000 cycles, for 1 watt main output 50 db approximately.
(b) Unweighted signal to noise, better than 40 db.

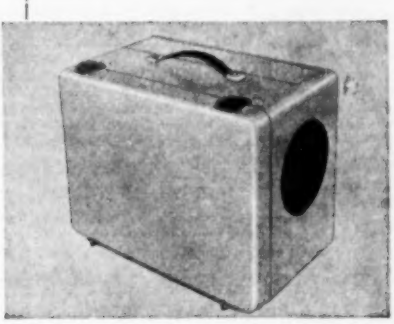
DISTORTION
At 1 watt output, 400 c.p.s. for Ferrotape, less than 5% total.

"WOW" AND FLUTTER (Expressed as change in tape velocity)
Less than 0.2% at 7½" p.s.

POWER CONSUMPTION: 110 watts.

FINISH
Light Battleship grey, British Standard Colour 631.

WEIGHT OF UNIT: 56 lbs.



British Ferrograph Recorder Co. Ltd.

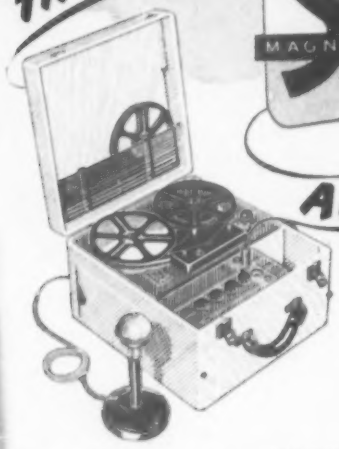
138 SLOANE ST., S.W.1 · SLO. 1510

THE FIRST

THE Soundmirror

MAGNETIC TAPE RECORDER

AND FOREMOST



A self-contained recorder-reproducer giving a faultless performance. The ideal equipment for HOME ENTERTAINMENT, PUBLIC ADDRESS, CONFERENCE RECORDING, and SOUND COMMENTARY for SILENT FILM PROJECTORS.

- "Finger Tip" control on one control provides for "Record" — "Play" "Rewind" or "Fast Forward" requirements.
- Constant Tape Speed—7.5 inches per second.
- Frequency Response—Essentially flat from 100-7500 c.p.s.
- High Quality Push Pull Output.
- Recording Duration 20 minutes per reel.
- Dynamic Range approximately 40 decibels.
- Power Supply 200 250 A.C. 50 cycles—Consumption 80 watts.

Now available in England—the book "Magnetic Recording" by Dr. S. J. Begun. A comprehensive treatise. Price 25/-, postage 9d. extra.

THERMIONIC PRODUCTS LTD.

Division S M W W. HYTHE, SOUTHAMPTON. Phone: Hythe 3255

London Showrooms: Morris House, Jermyn Street, Haymarket, S.W.1. Phone: Whitehall 6422

MODELS AVAILABLE FROM £69-10-0

Sales and Service Centres: Birmingham · Bristol · Manchester · Leeds · Newcastle and Glasgow

THE FAMOUS BENNETT COLLEGE

can help your career through personal postal tuition

In any of these subjects:

Accountancy Exams. ★ Aircraft Eng. & Radio ★ Architecture ★ Auditing ★ Book-keeping ★ Building ★ Carpentry ★ Chemistry ★ Civil Service ★ Commercial Art ★ Commercial Arithmetic ★ Company Law ★ Costing ★ Diesel Engines ★ Draughtsmanship ★ Electric Wiring ★ Engineering (Civil; Electrical; Mechanical; Motor; Steam; Structural) ★ Jigs, Tools & Fixtures ★ Journalism ★ Languages ★ Mathematics ★ Mining ★ Modern Business Methods ★ Plumbing ★ Police ★ Press Tool Work ★ Quantity Surveying ★ Radio ★ Salesmanship ★ Secretarial Exams. ★ Shorthand ★ Surveying ★ Telecommunications ★ Television ★ Textiles ★ Works Management ★ Workshop Practice

and GENERAL CERTIFICATE OF EDUCATION

SUCCESS WILL BE YOURS

As a Bennett College Student your own Personal Tutor will coach you until you qualify, at your pace with no time wasted. You will learn quickly, easily.

SEND TODAY FOR A FREE PROSPECTUS

TO THE BENNETT COLLEGE DEPT. L.C.1, SHEFFIELD

Please send me your prospectus on .....
(Subject)

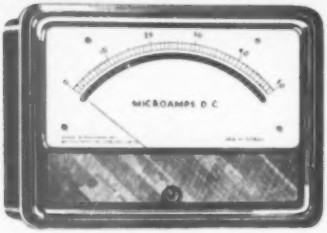
NAME .....

ADDRESS .....

..... AGE (IF UNDER 21) .....

(PLEASE WRITE IN BLOCK LETTERS)

SENSITIVE PANEL MOUNTING METERS



SIZE	2½"	3½"	5"
RANGE	25μA to 50A	15μA to 50A	15μA to 50A

S.50 types microammeters are stocked by M.R. Supplies Ltd. at 68, New Oxford Street, W.C.1

All sizes available with MIRROR SCALE 1st Grade Accuracy.

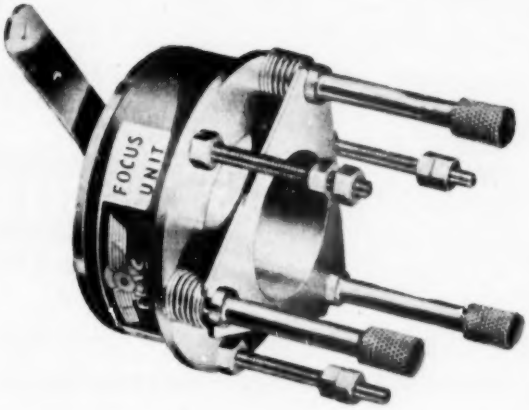
Available for delivery ex stock—
Universal Test Sets 1,000 and 20,000 Ohms/Volt.

BRITISH PHYSICAL LABORATORIES

HOUSEBOAT WORKS · RADLETT · HERTS

Telephone: RADLETT 5674-5-6

ELAC



TELEVISION COMPONENTS

MARK II SERIES
"THIN LENS"

P.M. Focus Units provide even focus over the whole tube face giving accurate picture positioning and easy vernier focus adjustment.

TYPE R17/MK.II	for	MULLARD	MW 22-16, MW 31-16, etc.	28/6 LIST
TYPE R20/MK.II	for	BRIMAR	C9B FERRANTI T92, T12/2, etc.....	30/- LIST
TYPE R25/MK.II	for	MAZDA	CRM 121, etc.	32/6 LIST
TYPE W20/MK.II	for	MULLARD	MW 36/22	50/- LIST
TYPE W22/MK.II	for	MULLARD	MW 41/1 ENG. ELEC. T.901	52/6 LIST
TYPE W25/MK.II	for	BRIMAR	C14 BM, C17 BM	57/6 LIST

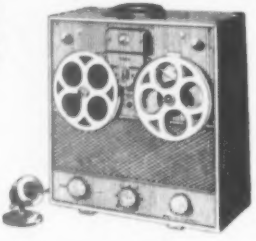
ELECTRO ACOUSTIC INDUSTRIES LTD.

STAMFORD WORKS, BROAD LANE, TOTTENHAM, N 15. Tel.: STAmford Hill 5606-8

High Fidelity

RECORDING IN THE HOME

The new Baird Portable Tape Recorder incorporates the most up-to-date advances in high fidelity tape recording technique . . . twin track (speed 7½" per second) giving one hour's recording per reel . . . excellent response between 50 and 10,000 c.p.s. . . . single control operation of motors for recording, playback and rewind. In addition to the 45 secs. rewind, a manual "forward" device is provided. The whole unit, made with the same meticulous care that is given to all Baird instruments, is self-contained in a robust case with carrying handle. Write for leaflet giving further information.

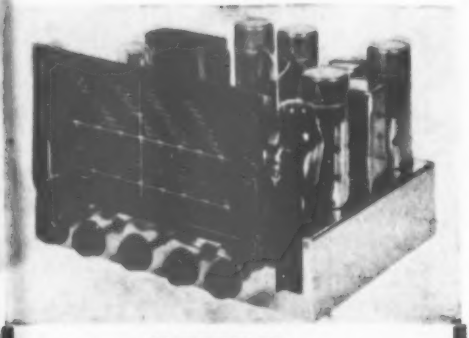


Complete with microphone and tape
65 *GNS.*

BAIRD

PORTABLE TAPE RECORDER

BAIRD TELEVISION LTD. LANCELOT ROAD · WEMBLEY · MIDDLESEX



WHY NOT **BUILD** YOUR OWN?

Not only are our RECEIVERS, AMPLIFIERS AND TEST EQUIPMENT second to none in performance and looks, but the knowledge that you have BUILT IT YOURSELF will make you EXTRA PROUD! The secret of "first-time success" lies in using our **ALIGNED COMPONENTS**, including ready-punched chassis, and fully identified parts. REMEMBER, NO COMPLICATED ALIGNING OR TEST GEAR REQUIRED! and with our "EASY AS A.B.C." CONSTRUCTION SHEETS it's like "falling off a log"! SEND NOW for the book containing all our circuits, with full details and technical descriptions together with Hints and Tips, Formulae, etc. Ask for the NEW ENLARGED EDITION of "THE HOME CONSTRUCTOR'S HANDBOOK," and enclose 2/6. This is definitely the best value on the market! SO DON'T DELAY—SEND TODAY!

RODING LABORATORIES
Dept. W.W.D.
301 HURN AIRPORT, CHRISTCHURCH, HANTS.

-towards perfection-

Britain's finest range of TUNER UNITS

LEI/2	Two T.R.F. for maximum quality from local stations.
LES	Superhet for areas where reception is more difficult or for greater selectivity than the LEI/2 provides.
DT/4	The most famous tuner of all. Selectivity position 1: T.R.F. Selectivity position 2: Superhet, wide band. Selectivity position 3: Superhet maximum selectivity. This tuner does not offer a compromise, but fidelity from local stations (1) more general reception (2) full superheterodyne sensitivity and selectivity.
DT/4L	As above but suitably modified for use with "Leak" amplifiers, etc. also
SPECIAL	A.M. and A.M./F.M. V.H.F. units.

Leaflets giving full details, together with other Lowther products, sent upon request.

THE LOWTHER MANUFACTURING CO.
Lowther House, St. Mark's Road, Bromley, Kent. RAV. 5225.

RADIO ENGINEERING OF SURPASSING EXCELLENCE

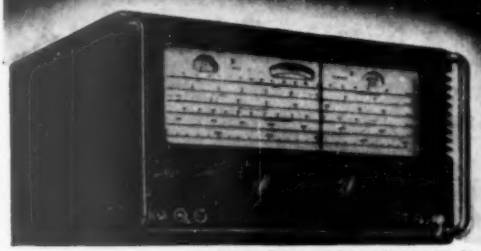
THE

EDDYSTONE

MODEL '680X'

COMMUNICATION RECEIVER

30 Mc/s to 480 Kc/s



USED PROFESSIONALLY IN ALL PARTS OF THE GLOBE

Compare critically the Eddystone "680X" against world-wide production of similar equipment and you will find nothing to equal either the performance or the construction of this receiver at anywhere near its price level.

The solid diecast chassis ensures robust mechanical strength and rigidity and adds to the electrical screening. The large open dial is accurately calibrated and permits precise tuning and re-setting. The flywheel-controlled, geared tuning mechanism is a masterpiece of light engineering; its perfection can only be judged by practical experience.

The "680X" has a first-class electrical specification. Fifteen valves are used; two RF and two IF stages, separate oscillator and push-pull output. Figures for sensitivity, noise, selectivity and image ratio are excellent. Frequency drift is negligible on all ranges.

The "680X" receiver is handsomely finished in polychromatic grey and has an all-round performance of the highest order.

LIST PRICE (in U.K.) £106 - 0 - 0

Please write for full specification to the manufacturers:

STRATTON & CO. LTD., EDDYSTONE WORKS, BIRMINGHAM 31

FOR HIGH FIDELITY RECORDINGS

Careful design and rigid control in manufacture, provide the critical listener with a reliable hard-wearing tape that will help to get the very best results from any tape recorder.

MAGNETIC DATA

Coercivity . . . . . 240-260 Oersteds
Total Remanent Flux . . 0.4/0.5 lines ½in. width
Uniformity throughout a reel . . . . . ±0.5 d.b.

FREQUENCY RANGE

50 c/s to 10 Kc/s at a playing speed of 7½ in./sec.

Medium coercivity gives a high signal output with an extended high-frequency response, whilst still retaining an easy erasure. Signal/noise ratio is high; transfer and distortion are negligible.

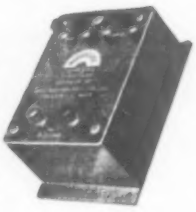
PLAYING TIMES (per track)

REELS	1¾"/SEC	3¾"/SEC	7½"/SEC	15"/SEC
1200 Ft.	120 Min.	60 Min.	30 Min.	15 Min.
600 Ft.	60 Min.	30 Min.	15 Min.	7½ Min.
300 Ft.	30 Min.	15 Min.	7½ Min.	3¾ Min.

2,400 ft. professional reels (10½" diameter double sided spools) now available.

If you want advice on tape-recording problems, our entire technical knowledge is at your disposal. Write to :— MINNESOTA MINING & MANUFACTURING CO. LTD., 167 Strand, London, W.C.2. *Telephone: TEMple Bar 6363*

WHARFEDALE
LOUDSPEAKER SEPARATORS



An effective device for dividing the bass and treble between two loudspeakers at low impedance, thus eliminating modulation distortion between treble and bass and permitting the most suitable mounting and placing of each speaker. The two loudspeakers should be fitted with magnets of similar flux density. The treble unit may be the same size as, or smaller than, the bass unit.

NEW!
HALF SECTION
3-WAY CROSSOVER UNIT
Type HSCR3 with crossover at 800 and 5,000 c/s. This half section unit can be used with either two-speaker or three-speaker systems. Now available at **£8 . 10 . 0.**

PRICES

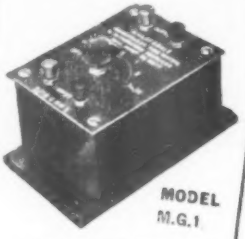
Separator A	7 to 16 ohm	72/5 (Terminals)
Separator B	"	62/5 (Tags)
Separator C	2 to 6 ohm	92/6 (Terminals)
Separator D	"	82/6 (Tags)
Separator E	7 to 16 ohm	58/6 (Terminals)
Separator F	"	48/6 (Tags)
Separator G	2 to 5 ohm	73/6 (Terminals)
Separator H	"	63/6 (Tags)

Wharfedale
WIRELESS WORKS
BRADFORD ROAD · IDLE · BRADFORD · YORKS
Telephone: IDLE 461

MICROGROOVE EQUALISER

Inserted in a Loudspeaker circuit this tone control unit gives a falling characteristic of about 3 DB per octave at 500 C.P.S. upwards. The unit, a tapped inductance with a six position switch is ideal for matching Microgroove recording characteristics or for use as a scratch filter on worn records. It is recommended for speakers of 2-16 ohm impedance up to 30 watts.

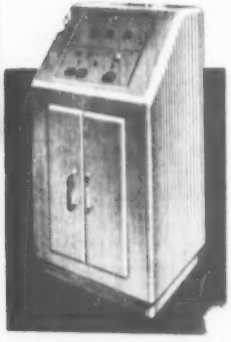
Dimensions: 7in. x 4½in. x 4½in.
Weight: 2lb. 6oz.



MODEL M.G.1

PRICE **57/6**

Widney-DORLEC
REGISTERED TRADE MARKS
CABINETS



We are now able to accept ORDERS for small or large quantities to any specified design

Owing to the limited supply of raw material, we regret that we cannot supply private individuals.

If you do not already know about the unique Cabinets write for details to:
TECHNICAL SALES OFFICE
220 NEW KING'S ROAD
LONDON S.W.6 Tel.: REN. 1601

Manufacturers
HALLAM SLEIGH & CHESTON LTD
WIDNEY WORKS · BIRMINGHAM 4

Widney PRODUCT
ESTABLISHED 1898

CONSTANT VOLTAGE POWER SUPPLY UNITS

MODEL 101-C

Output: 250 40v. 0-250 mA. max
Stability: Better than 0.1%.
Output Impedance: Less than 1 ohm.
Output Ripple: Less than 2mV. R.M.S.
Mains Supply: 200 250v. 40 60c/s.
Regulation down to zero load.

DETAILS ON REQUEST.

ALL-POWER TRANSFORMERS LTD.
CHERTSEY ROAD, BYFLEET, SURREY
Tel.: Byfleet 3224/5.

PREMIER RADIO Company

RADIO — S. H. MORRIS & CO. (RADIO) LTD. Please quote Dept. W.W — ESTAB. 40 YRS. TELEVISION

THE PREMIER De Luxe PORTABLE MAGNETIC TAPE RECORDER

THIS UNIT COMPARES MODEL FOR MODEL FAVOURABLY WITH ANY OTHER MAKE OF TAPE RECORDER AT DOUBLE THE PRICE

THE 7 VALVE AMPLIFIER HAS BEEN SPECIALLY DESIGNED FOR HIGH QUALITY REPRODUCTION

Brief Specification :—

VALVE LINE-UP :— EF37A First Stage (6SJ7 Second Stage and Tone Control; 6V6 Output; 6X5 Rectifier; Y63 Bias and Erase Oscillator; 7193 Record Level Amplifier 6U5 Magic Eye Record Level Indicator.

OUTPUT :—4 Watts. **FREQUENCY RANGE** :—80 c.p.s. to 9,000 c.p.s.

CONTROLS :— Volume, Record Playback switch; Treble Boost; Bass Boost—on-off.

A VISUAL MAGIC EYE Record Level Indicator is incorporated.

The unit is housed in a superbly finished rexine covered portable cabinet which incorporates a compartment for the Microphone when not in use. Weight complete 35 lb. (Unencloseted :— 22½in. long; 12½in. deep; 9½in. high.

This Recording Outfit has been designed for use with M.C.I. III "SCOTCH BOY" Magnetic Tape. With this high quality tape a frequency range of 30 c.p.s. to 9,000 c.p.s. at tape speed of 7½in./sec. can be readily achieved. Additional reels of 1,200ft. can be supplied at 35/-.

★ SUPPLIED COMPLETE WITH MICROPHONE, REEL OF "SCOTCH BOY" TAPE, AND REWIND SPOOL

The Recorder incorporates **THE NEW LANE TAPE TABLE**

Brief Specification :—

Made to high-standards and incorporates features ensuring low level of "Wow" and "Flutter" throughout the full length of tape.

FAST REWIND Provision for fast rewind and forward run in less than 1 min. (either direction). THREE MOTOR obviating friction drive.

HIGH FIDELITY RECORD PLAYBACK (1 HOUR AUTHOR PLAYING). The Table is fitted with high fidelity record play-back head of new design, wound to high inductance and a separate A.C. Erase Head. The Heads are self-track ing allowing approx. 1 hr. playing (with standard 1,200ft. Reel of Tape.

TAPE SPEED 7½in. sec. For use on A.C. 200-250, 50 cycles mains only.

39 GNS. ★ Plus Carr. & Ins. 10/-

To those who wish to purchase the complete Recorder separate units are available as follows:

THE BULL AMPLIFIER	PORTABLE CABINET	THE LANE TAPE TABLE	ROTHERMEL MICRUPHONE
Complete with 8" Speaker	£4 · 19 · 6	£16 · 10 · 0	£2 · 19 · 6
£14 · 14 · 0	Plus 5/- Pkg. Carr. & ins.	Plus 7/6 Pkg. Carr. & ins.	Specification below
Plus 7/6 Pkg. Carr. & ins.			

PREMIER

TABLE MODEL MAGNETIC TAPE RECORDER

INSTRUCTIONAL BOOKLET 2/6 This is studied as a complete Kit of the Tape Recorder is ordered

IN KIT FORM—The Kit includes ALL parts, valves, cabinet, loud speaker, Reel of "Scotch Boy" Tape Rewind Spool and The NEW Lane Tape Table already assembled, but excluding Microphone

SPECIFICATION AS PREVIOUSLY ADVERTISED **£29 : 8 : 0** (Packing and Carriage 15/-)

COMPLETE—to those unable to build this TAPE RECORDER we offer it built, tested and ready to plug in, complete with Microphone Reel of "Scotch Boy" Tape and Rewind Spool

SPECIFICATION AS PREVIOUSLY ADVERTISED **£36 : 10 : 0** (Packing, Carriage and Ins. 1 Gn.)

★ All the above Recorders are Fully Covered by the usual Premier Guarantee—3 months retrieval 1 month after engineers...

The NEW Microphone . . . for TAPE RECORDING · AMATEUR RADIO PUBLIC ADDRESS

The HIGH CRYSTAL MICROPHONE made specially for Premier by one of the world's leading manufacturers of Microphones. Although giving better all-round performance than most Microphones we are able to offer this Unit at less than half the price of any comparable Microphone of other make.

Brief Specification :—

SENSITIVITY —minus 55 d.b. relative to 1 v./dyne/cm².

RESPONSE —practically flat from 30-9,000 c.p.s., recommended load resistance 5 megohms for flat response low frequencies.

DIMENSIONS —overall length 5½in. Width 2½in. at widest part of flat Top, tapering to ¾in. at base of housing.

PRICE £2 : 19 : 6

Especially recommended for use with the PREMIER MAGNETIC TAPE RECORDER

The Microphone is protected by mechanical vibrations and low frequency wind noises. An attractive black all-metal housing provides complete screening and protection for the crystal insert. The crystals are readily interchangeable and carefully treated to minimise the effect of humidity. The modern design of the Unit enables it to be used as a Hand Microphone with a Base as a Desk Microphone or fixed to a Polaris or Photo stand. Screwed fitting for use of standard British type stand.

ALSO AVAILABLE FROM STOCK

LUSTRAPHONE Hi-fi Crystal Stand type £5-12-6. — Hand Mike £5-5. Table Stands for all the above 17/6.

ROTHERMEL Crystal Microphones: High Impedance Ball type £3-19-6 — Torpedo type £2-12-0

HOW BEING DEMONSTRATED AT THIS ADDRESS

207 · EDGWARE ROAD · LONDON · W.2

TERMS OF BUSINESS: Cash with order or C.O.D. over £1. Please add 1/- for Post. Orders under 10/- 1/6 under 40/- unless otherwise stated

Telephones: AMBassador 4033 PADdington 3271/2

PREMIER FOR SOUND RECORDING

WHEN IN TOWN . . . CALL AND SEE OUR VAST DISPLAY OF RADIO,—

PREMIER RADIO Company

(REGD.) ESTAB. 40 YRS.

RADIO TELEVISION

P. H. MORRIS & CO. (RADIO) LTD.
Please quote Dept. W W.

TRANSMITTER RECEIVER TYPE TR9H

Consists of Transmitter Type T1336 and Receiver R1132 in one case. This is a 9-valve Battery operated Unit covering 4.5 Mc/s. to 7.0 Mc/s. Crystal controlled complete with valves but less crystal. 50/-, plus 7/6 packing and postage.

EX-R.A.F. TRANSMITTER T1154 SERIES

A medium High Powered Transmitter for C.W.—M. C. W. 2 Frequency Ranges 1.0-3.5 Mc/s., 3.5-7 Mc/s. 200-500 Kc/s. 7 Stop Mechanism is arranged so that predetermined frequencies can be held or returned to. Complete with 4 valves—2-PT15 pentodes in parallel driven by an ML6 in a series-tuned Hartley oscillatory circuit. A further ML6 valve provides a 1,000 cycle side tone to enable the operator to log his transmission on C.W. **Price 39 6**, plus 10/- Pkg. and Carr.

12 v. POWER SUPPLY UNIT and L.F. AMPLIFIER

A 12v. vibrator power pack and amplifier combined. Unit contains 12 v. Mallory vibrator with filter components, 2 selenium metal rectifiers, approximately 340 v. 30 mA. 1-ATP4 valve, various chokes, transformers and a host of other useful components. Housed in a metal case measuring 11½in. wide, 6in. deep, 4in. high. **Price 29 6**, plus 5/- Pkg. & Carr.

POWER SUPPLY UNIT No. 7

Ref. ZA12871. A complete Unit for charging 6 volt Accumulators, by hand. Designed for the WS-31 could be used for many other purposes. Consists of a stout metal case, dim. 17½in. × 7½in., with detachable lid, containing hand driven generator, with gear mechanism which delivers 6 volts D.C. at 4 amps., also 2 volt cut-out and battery clamp. **Price 32 6**, plus 5/- post/pkg.

CAR BATTERIES—*BRAND NEW*

6 v. 11 plate—**PREMIER** Hght. 6¾in., Lgth. 7¾in., Dpth. 6¾in. Price 65/-.
6 v. 15 plate—**READING** Hght. 7¾in., Lgth. 9in., Dpth. 7¼in. Price 75/-.
6 v. 15 plate—**DELCO-REMY**. Hght. 7¾in., Lgth. 9in., Dpth. 7¼in. **Price 97 6**.
6 v. 23 plate—**DELCO-REMY**. Hght. 8¾in., Lgth. 13¾in., Dpth. 7¼in. **Price 110/-**.
12 v. 9 plate—**PREMIER** Hght. 6¾in., Lgth. 17¾in., Dpth. 6¾in. Price 110/-.

SEE PRICES PLUS 7/6 CASE & PACKING

SMITH'S 8-DAY AIRCRAFT CLOCKS

Luminous dial can be supplied with trip hands as illustrated or with plain glass front without trip hands. When ordering please specify type required. Housed in strong black Metal casing. Panel mounting. Dimensions: 4in. dia. dial. Fixing Panel 5¼in. sq. Protrudes 4¼in. from back. **Price 35/-**. Plus 1/6 post/pkg. ins.

MAINS NOISE ELIMINATOR KIT

Two specially designed chokes with three smoothing condensers with circuit diagram. Cuts out all mains noise. Can be assembled inside existing receiver, 6/- complete.

BUILD A PROFESSIONAL LOOKING RADIO SET AT LESS THAN HALF TO-DAY'S PRICE

We can supply all the parts to help you.
Drum (2)4in. dia. 1/6
Driving head 1/6
Double pointer 4/-
Spring 3d.
Nylon Cord (yard) 6d.
Dial Front Plate 2/6
Engraved Glass Dial 180-550 and 800-2,200 m. With station names, new wavebands 1/6
T.R.F. Coils, 180-550, 800-2,200 metres, pair 6/6
Punched chassis, 5-valve plus rectifier T.R.F. 3/9
Cabinet, Bakelite, in Walnut or Ivory or Wooden in Walnut finish 17/6
Packing and insurance 2/6
SEND 1/6 FOR EASY TO FOLLOW POINT-TO-POINT DIAGRAMS AND CIRCUIT DIAGRAM which shows how YOU can build the Receiver illustrated above.

THE COMPLETE KIT

to construct a 5-valve plus rectifier T.R.F. Receiver for use on 200/250 v. A.C. mains can be supplied at **£6 9 6**, plus 2/6 packing and carriage.
Each Kit is complete in every detail, nothing has to be made or improvised. Easy to follow, point-to-point diagrams are supplied, making construction very simple. The Dial is illuminated, and the Receiver housed in its Cabinet size 13in. × 8in. × 6in. presents an attractive appearance. The valve line-up is: 717A—H.F. Pentode. VR116 — Detector. APT4 — Output, and Metal Rectifier. Waveband coverage is for the medium and long bands. Choice of 3 Cabinets. Bakelite in Walnut or Ivory, or Wooden Walnut finish.

METAL RECTIFIERS FULL WAVE

6 v. 1 amp. 4/-; 12 v. 1 amp. 8/-.
E.M.I. Pencil Type:
Output: 650 v. 1 mA. 4/7 each; 1,000 v. 1 mA. 6/- each

SPECIAL OFFER
THE FAMOUS "CHANCERY" HIGH FIDELITY MICROCELL PICK-UP—TYPE GPX *for Standard and Long Playing*

The Chancery Light Weight GPX Pick-up embodies certain unique features achieving a standard of performance not possible with normal magnetic or crystal pick-ups. The secret of the high standard of performance is in the use of the special microcell crystal cartridge assembly which has an unusually wide frequency response. The sapphire stylus is precision ground and semi-permanent. With two cartridges either L.P. or Standard. **Price 50 6**. *Additional L.P. or Standard Cartridges can be supplied from stock at £1.11.6 each.*

HEADPHONES
Balanced Armature Low Resistance
Type 1, 5, 11 pair. Type 2, 8, 11 pair.
High Resistance 12 6 pair.
Lightweight High Resistance 14 6 pair.

ACCUMULATORS
By world-famous maker, 2 volt 10 amp. 4/11

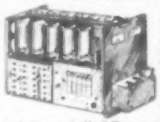
CRYSTAL MICROPHONE
An entirely insulated crystal microphone which can be easily used on A.C./D.C. amplifiers. High impedance. No background noise, really natural tone. The ideal Mike for tape, wire and disc recording and sound projectors. Price **22 6**.

BATTERY CHARGER KITS
All incorporate metal rectifiers. Transformers are suitable for 200/250 v. A.C. 50 cycle mains.
Cat. No.
2002 Charges 6 volt accumulator at 1 amp. Resistance supplied to charge 2 v. accumulator £1. 2. 6
2003 Charges 12 volt accumulator at 1 amp. £1. 7. 6

A WORLD-FAMOUS Manufacturer's Surplus of **RADIO RECEIVER CHASSIS 7-valve RECEIVER**

Built to exacting specifications and incorporating features ensuring superlative tonal qualities and world-wide reception. Specification: 8 watts push-pull output using 2 Mazda Pen. 45 Valves. Ample negative feedback is applied over all the audio-amplifier. Amplifier Mazda Type HL41DD gives signal Detection A.V.C. and Phase Splitting. Two stages of I.F. amplification 465 Kc/s., using Mazda VP41. **FOUR WAVEBANDS—14 M.-24 M., 24 M.-56 M., 190 M.-600 M., 600 M.-2,000 M.** DIRECT and VERNIER TUNING. Gram. position on Switch. Provision for external Loudspeaker. For use on 200/250 A.C. Mains. **£12 10/-**, plus 21/- pkg. and carr.

1124 RECEIVER UNIT



Range 20 to 40 Mcs. Contains six new Valves 5-SH2, 1-SD2, 1-15D 2 frequency changers, 1-4D1 24 ceramic trimmers, 6 ceramic valve-holders, 6 valve screening cans, 30 resistors, 2 pot-meters, mica and tubular condensers, ceramic coil formers 5-way 4 bank switch with long spindle I.F. transformers, etc. Brand new in maker's carton at **22 6**, plus 2/6 pkg.

★ *BRAND NEW* **R1155 RECEIVERS**

In original cases, complete with 10 valves. Frequency range 18.5 Mc/s.-75 Kc/s. in 5 wavebands. **£11/19/6**. 10/6 packing and carriage.

POWER SUPPLY UNIT

for above incorporating output stage. Supplies an output of 250 volts at 80 mA., which is ample for the R1155 with the output stage. Jones plugs for connecting the Power Pack to the Receiver are included. The 6V6 output stage complete with Output Transformer and 5in speaker is built into the unit. **Price £5 5/-**, plus 5/- packing and carriage.

As a special offer, power supply unit including speaker together with R1155 receiver. PRICE £16.19.6. *Plus 15/- pkg. & carr.*

★ *We now have available a small quantity of ex-R.A.F. Receivers. We can offer these at the ridiculously low price of £9/19/6, plus 10/- Pkg., Carr., Ins. These Receivers have been reconditioned and Air Tested and are fully guaranteed to be in perfect working order.*

BRAND NEW **R1355 RECEIVERS**

As specified for the "Inexpensive Televisor," complete with 11 valves. **39 6**, plus 7/6 packing and carriage.

0-1 mA METER IN PLASTIC CASE
The movement is 0-1 mA mounted in a case 3½in. square and 2¼in. high. The scale is 2¼in. long and the dial is 3¼in. diameter. There is ample room in the case for a switch, and multipliers. Internal Resistance 100 ohms. Price **27/6**.

2 STAGE QUALITY AMPLIFIER
Complete with 10in. Energised LOUDSPEAKER
4 watts output. A.C. 110/230v. mains.
£6.19.6
plus 5/- carriage.

EX-U.S.A. U.H.F. AERIAL
with untuned detector stage, consisting of V.R.92 valve etc. Brand new, in carton, 5/-.

207 · EDGWARE ROAD · LONDON · W·2

THIS IS OUR ONLY ADDRESS

TERMS OF BUSINESS: Cash with order or C.O.D. over £1. Please add 1/- for Post Orders under 20/- 2/6 under 40/- unless otherwise stated.

Telephones: AMBassador 4033 PADdington 3271/2

OPEN UNTIL 6PM ON SATURDAYS

IMPORTANT ANNOUNCEMENT: WE CANNOT ACCEPT RESPONSIBILITY FOR, NOR CAN WE GUARANTEE ANY—

—TELEVISION, GRAMOPHONE AND SOUND RECORDING COMPONENTS

PREMIER RADIO Company

(REGD.) ESTAB. 40 YRS.

B. H. MORRIS & CO. (RADIO) LTD.

Please quote Dept. W.W.

RADIO

PREMIER MAINS TRANSFORMERS

All primaries are tapped for 200-250-250 v. mains 40-100 cycles. All primaries are screened. All L.T.'S are centre tapped.

SP175B. 175 0-175, 50 m/a., 4 v. @ 1 a. 4 v. @ 3-5 a.	25/-
SP250B. 250-0-250, 60 m/a., 4 v. @ 1-2 a. 4 v. @ 3-5 a.	25/-
SP300A. 300-0-300, 60 m/a., 6.3 v. @ 2-3 a. 5 v. @ 2 a.	25/-
SP300B. 300-0-300, 60 m/a., 4 v. @ 2-3 a. 4 v. @ 3-5 a. 4 v. @ 1-2 a.	25/-
SP301A. 300-0-300, 120 m/a., 5 v. @ 2-3 a. 6.3 v. @ 5-4 a.	28/-
SP301B. 300-0-300, 125 m/a., 4 v. @ 2-3 a. 4 v. @ 2-3 a. 4 v. @ 3-5 a.	28/-
SP350A. 250-0-250, 100 m/a., 5 v. @ 2-3 a. 6.3 v. @ 2-3 a.	29/-
SP350B. 350-0-350, 100 m/a., 4 v. @ 2-3 a. 4 v. @ 2-3 a. 4 v. @ 3-5 a.	29/-
SP351. 350-0-350, 150 m/a., 4 v. @ 1-2 a. 4 v. @ 2-3 a. 4 v. @ 3-6 a.	36/-
SP375A. 375-0-375, 250 m/a., 6.3 v. @ 2-3 a. 6.3 v. @ 3-2 a. 5 v. @ 2-3 a.	39 6
SP375B. 375-0-375, 250 m/a., 4 v. @ 2-3 a. 4 v. @ 2-3 a. 4 v. @ 3-6 a.	39 6
SP425B. 425-0-425, 200 m/a., 4 v. @ 2-3 a. 4 v. @ 2-3 a. 4 v. @ 2-6 a. 4 v. @ 2-3 a.	42 6
SP501. 500-0-500, 150 m/a., 4 v. @ 2-3 a. 4 v. @ 2-3 a. 4 v. @ 2-2 a. 4 v. @ 3-5 a.	47/-
SP501A. 500-0-500, 150 m/a., 5 v. @ 2-3 a. 6.3 v. @ 2-2 a. 6.3 v. @ 2-3 a.	50/-
SP425A. 425-0-425, 200 m/a., 6.3 v. @ 2-3 a. 6.3 v. @ 3-5 a. 5 v. @ 2-5 a.	£2 6

PREMIER VARIABLE IMPEDANCE "MATCHMAKER" MO.IS OUTPUT TRANSFORMER

Designed to meet the demand for an efficient variable ratio Output Transformer. 11 ratios from 13 : 1 to 80 : 1 all centre-tapped and can be used to match any output valves either single- or push-pull. Class "A," "AB1," "AB2" or "B" to any low impedance speech coil or combination thereof. Primary Inductance 60 henries. 15 watts audio 100 m/a. Price 45/-.

WILLIAMSON AMPLIFIER TRANSFORMERS (To designers specification)

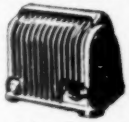
The Output Transformer 3-6 ohms sec., £4 4/-.
The Mains Transformer **PREMIER SP425A**, £2 12 6

SPECIAL OFFER
DOUBLE WOUND AUTO TRANSFORMER 250 watts.

Input/Output	Output/Input	
100 volts	110 volts	
110 "	113 "	
200 "	116 "	
210 "	119 "	Price 50/-.
220 "	122 "	Plus 2/6 Pkg. Carr.
230 "	134 "	
240 "	149 "	
250 "	"	

With the two windings connected in series a vast number of voltage tappings are available.

PREMIER'S MOST SENSATIONAL OFFER
THE FAMOUS 'SOBELL' 4 VALVE SUPERHET TABLE RECEIVER



M. & L. WAVEBANDS

Valve Line-up 1S37, 3S1.6, 1A87, 3SZ4.

Entirely transportable and unusually sensitive owing to special feed-back circuit employed. Housed in attractive plastic cabinet.

Choice of 5 Colours—Walnut, Pastel Peach, Ice Blue, Aero Green, Magenta.

Carrying handle incorporated in design. For use on 200/250 A.C.-D.C. mains.

Plus 5/- Pkg./Carr./Ins.

£8 . 19 . 6

Covered fully by Manufacturer's Guarantee

WHITE RUBBER MASKS

For 6in. Tube. 8/6.

MAGNETIC MARCHING COMPASS

Luminous Dial, enclosed in black bakelite case. Size 2in. × 2¼in. × 7⅛in. Price 19/6.

THE COLLARO 3RC511 3-SPEED AUTOMATIC RECORD CHANGER

A new large purchase enables us to offer these fine Motor Units at **NEW LOW PRICES** which are approximately 25% off the current list prices. Designed for simplicity and reliability at low cost. The Pick-up can be moved to any position whilst the machine is stationary or mixed without interfering with the mechanism. It is impossible to jam the mechanism and it should never go out of adjustment. The machine will play either 9-10in. or 9-12in. records not intermixed. The Motor is suitable only for A.C. supplies of 100/125 volts or 200/250 volts at a frequency of 50 cycles per second. The unit is supplied complete with the latest plug-in type Dual purpose Crystal Head, fitted with a Permanent **Sapphire Stylus**, and is suitable for use with either long-playing or standard recordings. All Pick-ups are fitted with a twin ballrace Pick-up base thus ensuring perfect freedom of movement. The Motor Plate is finished throughout in a special hammer finish and is virtually scratch proof. The complete Unit occupies a space 13in. × 12¼in. 4¾in. above the Motor Board and 2¾in. below.

PRICE £11 : 11 : 0 *including Purchase Tax.*

Plus 5/- Pkg./Carr. Ins.

GARRARD ELECTRIC 'GRAM MOTOR

BRAND NEW!

Induction Motor, 100-250 volt, 50 cycles A.C. only. The GARRARD Induction Motor is totally enclosed. Entirely free from radio frequency disturbance, magnetic hum and electrostatic variable speeds. With 12in. Turntable. Price £4 19 6. plus packing and carriage 5/-.

THE NEW BSR "MONARCH" AUTO-CHANGER

This is a 3-speed automatic mixer record changer designed to play 12in., 10in. and 7in. records intermixed in any order. Capacity 10 records, operates on 100/125—200/250 volts 50 c/s A.C.

New reversible dual stylus crystal pick-up has extended frequency range to 10,000 c.p.s. Self compensated for the **L.P. lower frequencies with the Turnover frequency at the correct point. PRICE £17/17/-,** plus 5/- packing, carriage and insurance.

AVAILABLE ONCE AGAIN!
A.C.R. 1 C.R. TUBES

(DIRECT REPLACEMENT FOR A.C.R. 2X)

5½in. screen. 4 volt Heater. This Electrostatic Tube is recommended as eminently suitable for Television. **15/-** plus 2/6 Pkg. Carr. and Ins. *Data sheet supplied*

V.C.R. 97 C.R. TUBES

We are once again able to offer this famous tube with the usual PREMIER guarantee of a full screen picture free from cut-off. Every tube is television picture tested before despatch. **£2** 5/- post paid.

PREMIER 3-BAND COIL PACK

Consists of a wired and aligned Coil Pack of the most Modern Type incorporating such features as Air Dielectric Trimmers. Litz wound medium wave coils. Tuned R.F. stage covers, 13-14, 40-120, 200-557 metres. Dimensions of pack: 6in. × 4¼in. × 2¼in. Complete circuit is supplied. Price 25/-.

Govt. Surplus—Ex W.D. STEEL AERIALS
ALL BRAND NEW

12ft.—3 4ft. sections of copper-plated steel highly flexible tapering ⅜in. to ⅛in. Brand new in container 6/6. Packing and carriage 1/6. Insulated Base, 3/-. Webbing waterproof carrying case with shoulder sling, 2/6. *These aerials make ideal fishing rods.*

CORRECT ASPECT WHITE RUBBER MASKS

For 12in. Round or Flat-faced Tube 16/11

SUPER QUALITY TELEVISION MAGNIFYING LENS

To suit 8in., 9in., or 7in. Tubes. Increase picture size considerably. 25/- each.

TELEVISION

METERS

Large stocks available a few of which are enumerated below :—

Full Scale Deflection	Scale Length 10in.	External Dimensions 12in.	Movement	
1A	1½	2¾ × 2¾	R.F. Thermo	7/6
2A	1½	2¾ × 2¾	M/C	8/6
2.5A	1½	2¾ × 2¾	R.F. Thermo	7/6
3A	1½	2¾ round	R.F. Thermo	7/6
3.5A	1½	2¾ × 2¾	R.F. Thermo	7/6
4A	1½	2¾ × 2¾	R.F. Thermo	7/6
5A	2	3½ round	Centre Zero	10/6
8A	1½	2¾ × 2¾	M/C	12/6
20A	1½	2¾ round	M/C	8/6
30A	1½	2¾ × 2¾	M/C	8/6
40A	1½	2¾ round	M/C	8/6
1.5M/A	1½	4 round	M/C	12/6
3M/A	1½	2¾ × 2¾	M/C	8/6
5M/A	1½	2¾ × 2¾	M/C	8/6
6M/A	2	3½ round	M/C	10/6
50M/A	1½	2¾ × 2¾	M/C	8/6
100M/A	1½	2¾ × 2¾	M/C	8/6
150M/A	1½	2¾ round	M/C	12/6
500 Micro/a	1½	2¾ round	M/C	15/-
20V	2	3½ round	M/C	8/6
40V	1½	2¾ × 2¾	M/C	8/6
1M/A	2	3½ round	M/C	25/-

MOVING COIL METER

A super quality Moving Coil Meter basic movement 2 mA. Scale dimension 2½in. Overall dimensions 2¾in. dia. 1¾in. deep. Bakelite Case projecting type. At present scaled 1 amp. R.F. By removing thermo couple, reversing scale and recalibrating the meter, a high grade test instrument with any range above the basic F.S.D. may be built up. Price 4 9.

RADIO CABINET (WALNUT FINISH)

Outside dimensions: 16½in. high, 9½in. deep, 17in. wide

A beautifully made cabinet. **£3/10/-**, plus 7/6 carr./pkg.

5-VALVE SUPERHET RADIO CHASSIS

Drilled and cut out for all necessary control mountings and Mains Transformer, fitted with 5 Amphenol Octal, Valveholders, Aerial, Earth and Gramophone Sockets. 500 pf Tuning Gang Condenser, full vision drive Tuning Assembly consisting of unbreakable Perspex 3-coloured scale for long, medium and short wavebands. Calibrated in metres, kilocycles and station names, price 39/6.

AS A SPECIAL OFFER—CABINET ILLUSTRATED ABOVE AND CHASSIS, TOGETHER £3. 3. 0 Plus 7/6 Carr./Pkg. & Insurance.

THIS IS OUR ONLY ADDRESS

207 · EDGWARE ROAD · LONDON · W·2

TERMS OF BUSINESS:
Cash with order or C.O.D. over £1. Please add 1/- for Post Orders under 10/- 1/6 under 40/- unless otherwise stated

Telephones: AMBassador 4033 PADdington 3271/2

OPEN UNTIL 6PM ON SATURDAYS

—KIT OR COMPONENT SOLD AS A PREMIER PRODUCT BY FIRMS OTHER THAN OURSELVES

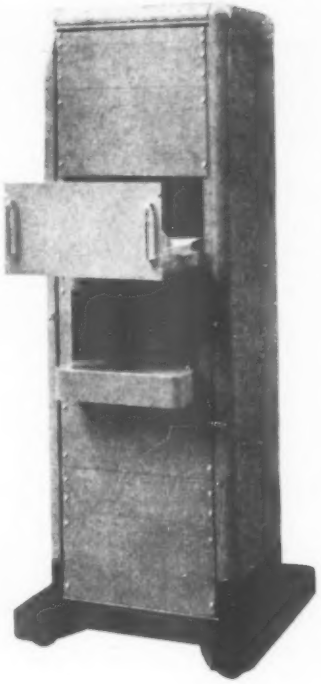
IMHOF'S

The leading independent manufacturers of cabinets for all types of electronic equipment.

Quick delivery, no tooling charges, competitive prices due to quantity production and no design worries are some of the advantages offered by Imhof's

STANDARD ENCLOSED RACKS

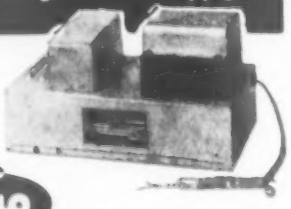
Height 6ft. or 4ft., depth 19in., standard 19in. rack panels. Semi-standard 24in. deep and or 22½in. panels. Available in any quantity as single units or bolted together in multiform. Non-standard sizes available to special order. Accessories include panels, chassis, runners, gram. and desk units, handles, etc.



IMHOF'S

ALFRED IMHOF LTD., 112-116 NEW OXFORD ST., LONDON, W.C.1. MUS. 7871

ALL the A.C. power you require from your D.C. supply



with a

Valradio

D·C·/A·C· CONVERTER

Models for Electric Gramophones from **£8 16 0**

Models for

- Radiograms and Autochange Radiograms (inc. 3-speed motors)
- Radios, Televisions, etc. *from* **£11 16 6**
- Tape Recorders, Dictating Machines, etc.

Input, 6, 12, 24, 32, 50, 110 or 200 250V. D.C.
Output 220V. 50 or 60 c/s.

Valradio (Electrical) Ltd. *Descriptive literature W.W. 23 from the manufacturers:* NEW CHAPEL ROAD, HIGH ST., FELTHAM, MIDDX. Tel.: FELtham 4242

Service Dept.: 57 Fortess Road, London, N.W.5. Tel.: GULliver 5165 & 7232
Scottish Depot: 257 Gorbals St., Glasgow, C.5. Tel.: South 1326
Overseas enquiries to nearest E.M.I. Organisation Depot

Come to Classic for "The Classic Service"

TELEVISION RECEIVERS, TUBES & ACCESSORIES

Desc. No.		Cash	or Deposit & monthly payments	Amt. of payments
125.	Teleman Wall Projection TV	£125 0 0	£45 0 0 or 18 monthly payments of	153 4 1 16 8
121.	Decca Wall Projection TV	£158 0 0	£58 0 0 or 18 monthly payments of	194 8 1 5 4
122.	Decca Wall Projection TV	£350 0 0	£125 0 0 or 18 monthly payments of	452 6 25 2 0
135.	Raymond Wall Projection TV	£175 0 0	£60 0 0 or 18 monthly payments of	220 - 12 2 6
123.	Pye 14" Direct Viewing	£170 0 0	£45 0 0 or 18 monthly payments of	160 - 8 11 -
133.	Pete Scott 14" Direct Viewing	£128 0 0	£44 0 0 or 18 monthly payments of	160 - 8 11 0 -
131.	Ferguson 14" Direct Viewing	£110 5 0	£36 15 0 or 18 monthly payments of	140 - 7 9 7 6
151.	Armstrong 12" Chassis	£83 0 0	£17 13 4	98 4
134.	Viewmaster Stages 1, 2 & 3	£10 7 8	£3 8 8	14 9
131.	Viewmaster Stage 5	£10 7 10	£3 10 0	14 -
133.	Viewmaster Stages 4, 6 & 7	£11 3 0	£4 0 0	15 3
134.	Viewmaster Components	£32 0 0	£10 0 0	45 -
137.	Viewmaster Set in Valve	£8 8 0	£3 8 0	11 6
138.	Viewmaster 9" Tailor Table Cabinet	£6 3 9	£2 3 9	10 -
142.	Viewmaster 9" Tailor Cutech Cabinet	£13 15 0	£3 15 0	20 -
143.	Viewmaster 12" Tailor Table Cabinet	£7 14 0	£2 14 0	11 8
141.	Viewmaster 12" Tailor Console Cabinet	£13 15 0	£3 15 0	20 -
142.	Viewmaster 12" Ashdown Cabt., with doors	£13 10 -	£3 10 0	20 -
143.	Viewmaster 12" Classic Cabt., with doors	£15 0 0	£5 0 0	20 -
144.	Philips Projection Unit	£37 10 0	£12 12 0	48 4
145.	Allen Wide Angle Scanning Components	£8 9 0	£3 3 0	10 6
146.	Mazda, Mullard, GEC, etc., 9" Tubes	£13 13 8	£4 15 0	19 2
147.	Mazda, Mullard, GEC, etc., 12" Tubes	£18 4 10	£6 9 0	23 6
148.	Mullard 12" Tube	£24 6 5	£8 6 6	31 -
149.	English Electric 17" Metal Tube 901	£24 6 5	£8 6 6	31 -
150.	TELE-KING 16" T.V. Instruction Booklet	6 0	—	—

Full range of Aerialite & Belling Lee aerials available from stock (ex Cash or H.P.)

We wish all our readers a Very Happy Christmas and a Prosperous New Year

The Classic Electrical Co. Ltd.,

"THE HI-FI TELEVISION SPECIALISTS"

353 354, LOWER ADDISCOMBE ROAD, CROYDON, SURREY.

TELE: ADDISCOMBE 6061/1062.

"CURRENT RELEASE"

150 "SOUND" REASONS TO

Come to Classic for "The Classic Service"

QUALITY AMPLIFIERS • SPEAKERS • RADIO FEEDER UNITS • MOTORS AND AUTO-CHANGERS • PICKUPS • TAPE AND DISC RECORDING AND REPRODUCING EQUIPMENT • HI-FI AND BIG SCREEN TELEVISION RECEIVERS.

WE HAVE THE FOLLOWING 150 QUALITY ITEMS AVAILABLE FROM STOCK

RADIO FEEDERS, AMPLIFIERS & TONE CONTROL UNITS

Item No.		Cash	or Deposit	and 12 p'monthly
1.	Leak T12 with Control Unit	£37 18 0	£12 12 0	4/4
2.	Leak Feeder Radio Unit	£27 10 0	£12 12 0	4/4
3.	Leak Varislope	£12 12 0	£4 4 0	17/6
4.	Quad Amplifier	£25 0 0	£12 0 0	44/6
5.	Quad Radio Feeder Unit	£26 10 0	£9 0 0	33/4
6.	Sound Sales VZ Amplifier	£32 10 0	£13 10 0	33/4
7.	Rogers R.16. Mixer	£11 0 0	£4 0 0	15/-
8.	Rogers Ruby de luxe Amplifier	£51 0 0	£7 0 0	39/6
9.	Decca Type No. P.A.5	£17 10 0	£6 10 0	21/8
10.	Decca Type No. P.A.6	£26 5 0	£8 5 0	35/-
11.	Goodmans Amplifier 5A.10	£15 15 0	£4 0 0	23/4
12.	Goodmans Control Unit T.C.	£8 8 0	£3 3 0	12/6
13.	Goodmans Control Unit P.U.10	£12 12 0	£4 4 0	17/6
14.	Goodmans Radio Amplifier	£19 10 0	£6 10 0	25/8
15.	Goodmans Williamson 6W18 Amplifier	£33 5 0	£13 10 0	39/4
16.	Goodmans Control Unit P.F.A.	£22 10 0	£7 10 0	29/9

MOTORS & AUTOCHANGERS

Item No.		Cash	or Deposit	and 12 p'monthly
17.	Garrard RC.72A Unit with Head	£18 18 8	£5 16 6	21/8
18.	Garrard RC.75A	£16 17 6	£6 10 0	22/6
19.	Garrard RC.80	£14 19 0	£6 15 0	23/4
20.	Garrard Transcription Motor 201	£13 13 0	£5 0 0	20/2
21.	Garrard Transcription Motor 201 B	£23 18 0	£8 0 0	29/2
22.	Garrard Transcription Motor 201 SB	£24 12 6	£9 0 0	29/2
23.	Connoisseur 2-speed Motor & Turntable	£22 16 0	£8 0 0	28/2
24.	Connoisseur Jeweled	£22 16 0	£8 0 0	28/2
25.	Decca GI 4 Unit	£9 19 11	£3 10 0	14/-
26.	Decca GI 4A Acos Heads	£11 17 6	£4 0 0	16/8
27.	Decca GI 4M Decca Heads	£13 10 0	£5 0 0	19/6
28.	B.S.R. MU.1 Motor & Turntable	£3 18 7	£1 6 6	7/8
29.	B.S.R. MU.2 Motor & Turntable	£6 6 6	£2 2 0	10/6
30.	B.S.R. GU.4 Motor & Turntable	£13 19 0	£5 0 0	19/6
31.	Collaro 3-speed Auto 7", 10", 12"	£12 5 0	£5 0 0	14/6
32.	Collaro 3-speed Mixer 7", 10", 12"	£14 10 0	£5 0 0	20/-
33.	Plessey 3-speed Auto 7", 10", 12"	£18 18 0	£6 6 0	26/6
34.	B.S.R. Monarch 7", 10", 12"	£17 17 0	£6 6 0	26/6
35.	Chancery 331 3-Auto-Inserts	£3 15 0	£1 5 0	5/-
36.	Trixette A358 3-speed Garrard	£42 0 0	£15 0 0	53/4
37.	Decca Decalian 2-speed S.p.	£32 0 0	£12 0 0	40/-

LOUDSPEAKERS

Item No.		Cash	or Deposit	and 12 p'monthly
24.	Goodmans Audiom 60	£11 12 4	£4 9 0	15/6
39.	Goodmans Axiom 150 Mk. II	£15 - 0	£5 - 0	20/-
40.	Tannoy Dual Concentric 8"	£13 16 0	£12 16 0	31/4
41.	Tannoy Dual Concentric 12"	£17 10 0	£6 0 0	23/-
42.	Lowther Super 5	£21 0 0	£10 8 0	40/6
43.	Wharfedale Super 5/SP/AL	£7 4 4	£2 4 4	13/4
44.	Wharfedale Super 5/SP/AL	£7 4 4	£2 4 4	13/4
45.	Wharfedale 10/HF1 Mono 2-unit	£25 10 0	£28 12 0	104/-
46.	Wharfedale 10" Gladdale	£8 8 0	£2 10 0	13/4
47.	Wharfedale 10"/SP/B	£18 10 0	£6 3 4	25/4
48.	Wharfedale W.15/SP/B	£9 9 0	£3 3 0	14/-
49.	Wharfedale W.15/SP/AL	£12 12 0	£4 4 0	17/4
50.	Wharfedale W.15/SP/B	£16 0 0	£5 10 0	21/8
51.	Wharfedale 12" unit	£9 9 0	£3 3 0	14/-
52.	Rola G.12/10/Te	£9 9 0	£3 3 0	14/-
53.	Class "C" Crossover 2-unit	£45 0 0	£15 0 0	58/6
54.	Assembly of Corner Ribbon	£5 5 0	£2 3 0	12/-
55.	Vitavox "Klipschorn"	£145 0 0	£49 0 0	1-guinea
56.	Chaffex Reflex Cabinet	£10 10 0	£3 10 0	15/-
57.	Chaffex Corner Cabinet	£15 15 0	£5 5 0	21/-
58.	Classic Hi-Fi Cabinet for Quad/Leak Amp	£20 0 0	£10 0 0	40/-
59.	Voigt unit only	£42 0 0	£14 0 0	53/4
60.	Voigt Corner Horn (White)	£48 0 0	£16 0 0	66/-
61.	Voigt Corner Horn (Veneer)	£60 0 0	£20 0 0	76/8

TAPE DESKS & TAPE RECORDERS

Item No.		Cash	or Deposit	and 12 p'monthly
62.	Wearite Type A Tape Deck	£35 0 0	£12 0 0	45/-
63.	Wearite Type B Tape Deck	£40 0 0	£13 6 8	50/-
64.	Brenmatic Deck SRP Heads	£42 0 0	£14 0 0	55/-
65.	Sound Mirror Type A	£33 0 0	£11 0 0	41/8
66.	Truvox Type A	£23 2 0	£8 0 0	30/2
67.	Lane Type 1	£16 10 0	£5 10 0	22/-
68.	Qualitape Type 1	£16 16 0	£5 17 0	22/-
69.	Excel Pro Tape Desk	£75 0 0	£25 0 0	97/1
70.	MSS Type PMR1 Recorder	£110 0 0	£30 0 0	191/8
71.	Ferrograph Type A	£79 10 0	£26 10 0	100/-
72.	Vortexion Recorder	£81 0 0	£29 12 0	103/8
73.	Leak Portable to order	£119 0 0	£40 0 0	150/8
74.	Sound Mirror Portable	£79 10 0	£26 10 0	100/-
75.	Sound Mirror Table Model	£69 10 0	£23 10 0	88/2
76.	Simon Model B	£60 0 0	£20 0 0	76/8
77.	Simon Model A	£83 0 0	£27 13 8	101/-
78.	Wirek Wiremograph	£65 0 0	£25 0 0	78/6
79.	Wirek Repeater	£58 0 0	£20 0 0	72/-
80.	Brenmatic Amplifiers	£62 0 0	£21 0 0	78/7
81.	Symphony Baird Mk. 2	£68 5 0	£22 15 0	86/3

TAPE RECORDING ACCESSORIES & EQUIPMENT

Item No.		Cash Price
82.	Brenmatic Circuits	5 0
83.	Brenmatic Plate Coil	9 0
84.	Brenmatic Oscillator Coil	9 0
85.	Brenmatic Rise Reg. to Unit	12 6
86.	Brenmatic Mineral Screens	4 6
87.	Brenmatic Tape Guides	5 0
88.	Brenmatic SRP Heads	£3 5 0
89.	Brenmatic SRP Heads	£3 15 0
90.	Brenmatic SR Erase Heads	£3 5 0
91.	Sound Mirror Tape per reel	£1 5 0
92.	G.E.C. Tape per reel	£1 10 0
93.	EMI Tape per reel	£1 10 0
94.	Scotch Boy Tape per reel	£1 15 0
95.	Collaro Tape Rec. Models*	£1 18 0
96.	Spare Spools	4 6
97.	Acos Microphone	£2 6 0
98.	Reflectorol Mike	£3 0 0
99.	Reslo Ribbon Mike	£10 0 0
100.	Reslo Table Stand	£2 12 0
101.	Reslo Moving Coil Mike	£5 5 0
102.	B.S.R. PP.10, 1,440 r.p.m.	£1 18 0
103.	B.S.R. SR.1, 2,750 r.p.m.	£1 12 0
104.	B.S.R. SR.2, 2,750 r.p.m.	£1 5 0

* L.G. and right drive.

PICKUPS & PICKUP HEADS & CROSS-OVER UNITS
(H.P. Available over £10)

Item No.		Cash Price
105.	Decca XMS with two Heads	£7 0 0
106.	Decca Hi-Fi Mag. Pick-up Head	£2 19 6
107.	Connoisseur Pick-up	£6 9 0
108.	Connoisseur Pick-up Head	£3 11 8
109.	Connoisseur Pick-up Transformer	£1 10 0
110.	Leak Ruby Standard	£12 12 0
111.	Leak Ruby L.P.	£12 12 0
112.	Leak Diamond Std.	£10 2 6
113.	Leak Diamond L.P.	£10 2 6
114.	Leak Pick-up Transformer	£2 15 0
115.	Acos G.P.15	£3 11 5
116.	Acos G.P.19	£3 11 5
117.	Acos L.P. & Std. Heads	£2 3 2
118.	Acos Pick-up Arm	£1 7 6
119.	Decca Pick-up Arm	£1 7 6
120.	Collaro Pick-up Arm	£1 5 6
121.	Chancery Crystal Pick-up	£2 12 0
122.	Ingranet Crystal Pick-up	£2 1 -
123.	Wharfedale X cut Jade, all types from	£2 5 0
124.	EMI Steep Cut Pitler	£4 10 -

◀—— *See further advertisement opposite for items 125—150.*

REMEMBER—"THERE IS NO SUBSTITUTE FOR QUALITY"

Quality Amplifiers, Speakers and Tape Recording Equipment Demonstrated Daily.

Television Specialists—Components for Wenvoe and Lizzy Screen TV available from stock. Cathode Ray Tubes, Projection Units, Wide Angle Learning Components, all types and makes of Valves, etc., by return of post. We will ship to any part of the British Isles or Abroad.

Terms: CASH OR DEPOSIT WITH ORDER. H.P. Facilities limited to Gt. Britain and Northern Ireland.

The Classic Electrical Co. Ltd.

"THE HI-FI TELEVISION SPECIALISTS"

353/364, LOWER ADDISCOMBE ROAD, CROYDON, SURREY. TELE: ADDISCOMBE 6061/6062

SELECTIVE TRANSMISSION MEASURING SET

B.C.C. introduce another outstanding success in their development of Measuring Instruments.

This instrument is a direct reading, selective, gain and loss measuring set to be used with an external signal generator.

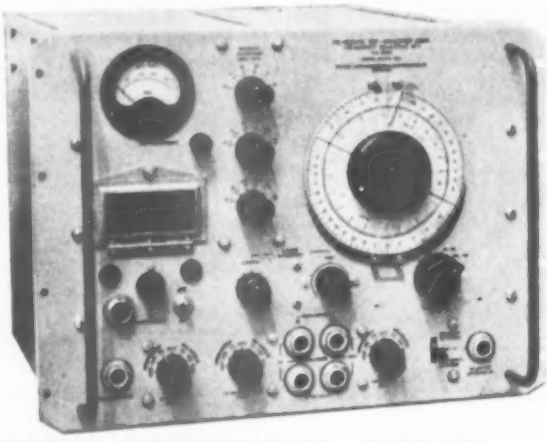
Four terminal networks, active and passive, balanced or unbalanced, can be measured.

Facilities are provided for use as a high impedance Selective Detector Amplifier.

Frequency Coverage : 1—68 Kc/s in 4 ranges.
Range of Measurements : Gain 0-60 db. Loss 0-80 db.
Accuracy : ± 0.5 db.
Impedance range : 75, 150 and 600 ohms. balanced or unbalanced.
Det.-Amp. Sensitivity : 10-12 μV.
Power Supplies : 100-150-200-250v. 50 c/s.

Based on Signals Research and Development Establishment design.

Manufactured for Ministry of Supply and G.P.O.



BRITISH COMMUNICATIONS CORPORATION LIMITED
SECOND WAY, EXHIBITION GROUNDS, WEMBLEY, MIDDX.
Tel. : WEMBLEY 1212 Cables : BEECEECEE, WEMBLEY

EXPORTING SIMPLIFIED

Exporting procedure can be a headache to the manufacturer wishing to sell to overseas markets. That is where we come in. Shipping and forwarding has become a highly developed side of our business during the last four years. We can relieve manufacturers of all the paperwork and formalities necessary for the efficient forwarding of electrical and electronic goods to foreign buyers. We can pack them, too, if required. Not only that, but our wide connection overseas may enable us to bring you export orders. Let us discuss the help we could be to you.

N. MIERS
& CO. LTD.

115 Gower Street, London, W.C.1

'Phone : EUSton 7515. 'Grams : Miersco, Westcent

* 10 WATTS PUSH-PULL HIGH FIDELITY OUTPUT.
** 2 TRACKS PER TAPE. (2 Hrs. RECORDING).
*** 3 INPUTS : CRYSTAL AND M/C MICS. AND GRAM.
**** 3 TAPE SPEEDS, 3¾in., 7½in. and 15in. per second.
***** 2 SEPARATE INPUT CONTROLS FOR MIXING.
****** DETACHABLE SPEAKER. Many other features.

Measuring 15½"x10"x12½" Versatility with quality **56 GNS.**
Our Super MODELS "10" & "12" RECORDERS
also available shortly at **£66-10-0**
DEMONSTRATIONS AND FULLY ILLUSTRATED BROCHURE

ASSOCIATED CINE EQUIPMENTS LTD.
353, BEXLEY ROAD, ERITH, KENT. Phone : Erith 2543.

SERVICE SHEETS

The one you require enclosed if available in a dozen assorted of our best choice.

10/6

Special Purpose VALVES

O1A	8/-	6SA7gt	21/6
1A4	14/2	7B7	15/6
1B4	14/2	10	12/9
1F4	10/9	22	19/6
1S5	12/9	71A	9/5
1P5	13/1	112A	12/9
1J6	12/9	81	20/2
9A8	10/1	166	5/-
CAH7	7/-	954	5/-

And many other types. Ask for Special List.

"DEMOBBED VALVES" and equiv.

Manual **2/3**

BOOKS:

Radio valve application Manual	5/-
Constructors Manual	3/-
Designs Manual	2/6
Midget Construction	3/6
Practical Beginner	3/-
40 Germanium Diode Circuits	3/-
Wire Records Manual	2/6

BOOKS:

Wireless Servicing Manual, by W. T. Cocking	12/6
Radio Data Charts	7/6
T.V. Servicing	4/6
Radio and T.V. Laboratory	2/6
T.V. Interference	2/-
T.V. Fault Finding	5/-
Int. Tube Encyclopedia	42/-

EASY TERMS ON ALL TAYLOR METERS

Terms up to 10 months and very near Cash Price. Please ask for full List, Terms and Proposal Form.

RESISTOR COLOUR CODE INDICATORS

Accurate Disc Type

1/3

ROD Antennas

1ft. Sections, interlocking and extending, copper plated steel. BARGAIN, dozen

2/6

B.T.H. Germanium Crystal Diode

for the "HANDYMAN," Crystal Valves Radio Receiver, complete with Diagram and operating instructions.

3/-

HANDY HELPER

for Radio Repairs, Definitions, Conversion Values, Resistances, Condensers, Symbols, Cables, **Radio Hints**, Superhet Receiver, **Tests, Radio Troubles**, Abbreviations, Batteries, Wavelength and Frequency, Loudspeakers, 22 Tables.

3/3

PIFCO, all-in-one Radiometer

A.C./D.C., tests everything in Radio. Complete with Test prods. Limited Supply. Post 6d.

29/6

RESISTORS

½-w. 2,000Ω 120,000 Ω, 250,000Ω 1 w tt 500, 680, 750, 1,000, 1,500, 2,500, 3,000, 7,500, 10,000, 15,000, 20,000, 25,000Ω

each **6d.**

AMERICAN Type A.C. Electric Engravers

52/6

for Metals, Plastics, Glass. Fits any A.C. plug. Powerful. Guaranteed.

CONDENSERS

Wire Ends

2 m.d 450 v.	2/-
4 „ 450 v.	2/6
8 „ 500 v.	2/6
16 „ 500 v.	2/6
32 „ 25 v.	1/3
50 „ 50 v.	2/-

Cans

8×8 m.d. 500 v.	3/6
8×16 „ 500 v.	4/9
16×16 „ 500 v.	5/9
16×24 „ 350 v.	5/6
16×32 „ 275 v.	6/6

16 m.d. Govt. Surplus 175 v. each 1/-.

Post 6d

CONDENSER TESTERS & RECTIFIER UNITS

Plugs straight into A.C. mains 200/240 v., and is indispensable for examination of condensers. Very slight and intermittent leakages which cannot be discovered by conventional instruments can be traced by this unit. Complete. Post 1/-. Supplies are becoming limited.

39/6

TAYLOR Montrose 7-range Multimeters, A.C./D.C.

0-6-30-150-300 volt 0-30 mA.—300 mA.-3 amperes precision M/I movement.

Post Free **50/-**

TEST PRODS

of superb quality insulated and colour coded.

Complete with plugs

3/6

Electric ENGRAVER

For all metals, plastics, etc. Plugs into A.C. light socket. Powerful.

15/-

Post 1/-.

HEADPHONES

High resistance light weight S. G. BROWN make at 30/- and 27/- also special type Brand New

14/-

A.C./D.C. NEON TESTER, TYPE 400

This new model is specially designed for one-pole tests on mains, incorporating a highly sensitive neon tube—striking voltage 100/300 v. A.C./D.C. Also suitable for indicating polarity on D.C. current, when the glow of the lower electrode will indicate the negative pole. Post 6d.

11/3

AMPLION TEST METER

1,000 ohm per volt on all D.C. and A.C. ranges, 10 v., 100 v., and 500 v. D.C. and A.C., 50 mA. and 500 mA. D.C. Resistance up to 200,000 ohm (3,000 ohm centre scale), with self contained battery. 5,000 volt range with a separate H.T. test prod (9/6 extra). Supplied with test prods. Multi-colour scale easily readable.

POST FREE **£5**

ADCOLA 3 16in. DIA. BIT SOLDERING INSTRUMENT.

Miniature type to meet every requirement for Radio, Television, etc.

22/6 Post 1/-

HOME BROADCASTER

Connects to radio or gram. Talk over your own radio. room to room. Easy to fix. Two mik s make 2-station house phone in your own home. Order to-day.

12/6 post 1/6.

Ex-Govt. Surplus SPEAKER

Matching Transformers Guaranteed

Sale Price

2/6

MORSE BUZZER OUTFITS

Consisting of a buzzer, a morse key and a battery compartment, all mounted on a polished baseboard. All parts high grade ex-Air Ministry. An excellent gift for a boy. Post free.

6/-

Universal Minor, **£10**. Model 7 and 40 Avometers, **£19**. Electronic Testmeter, **£40**. D.C. Avominor, **£5**.

SOLDERING IRON

● The Perfect Small Soldering Iron. ● Adjustable Bit. ● Easy to Handle. ● Weight Approx. 4 oz. ● Heating Time 3 min. ● 40 watt Economy Consumption. ● Voltage Ratges 100/110 v., 200/220 v., 230/250 v., other ratings available on request. ● Long life and Efficiency. ● Replacement Elements and Bits always available. Just the convenient Iron required for intricate and fine soldering.

16/9

PAINT SPRAYER

for easy spraying any liquid or paint. Gives fine finish to your car, bike, furniture, etc. Makes every man a Handyman.

Post 9d. **15/6**

HYDROMETERS

Unbreakable all plastic model, Patented. Correct for 60° F.

Only

7/6

Post 6d.

"WONDER" HAND TOOL 6 TOOLS IN ONE

10/- Plus 1/6 post and pkg. (reduced from 20/-)

Punches, Bends and Shears Metal Strip, Rod and Angle. Every Handyman, Mechanic and Service Engineer needs one! 1,000 used!

Unique! Order TODAY!

Electric Paint Stripper

SAFE . . . puts the heat just where it's wanted —nowhere else.
CLEAN . . . no fumes —no messy filling up.
EASY . . . a little practice and you're expert.
ECONOMICAL . . . runs for 8 hours for 3d.

List 47/6 Post 1/3 OUR PRICE **37/6**

EVERLASTING GRAMOPHONE NEEDLE

JEWEL (SAPPHIRE mounted). Suits any type of Pick-up or Record. Improves quality, eliminates record wear. 3 Types: Loud, Soft and Trailer.

3 for 10/-

3/6 each

BLO-LITE

High-power super-heat flame. PERFECT for Light Brazing, Tempering, Hard Soldering, Silver Soldg., Thawing, Sweating, etc. Fits into ordinary Gas Tubing. No extra air pressure. Full instructions.

2/6 post 6d.

Do your own

SILVER PLATING

on Copper, Brass, Nickel, Chrome with real silver with

NU-SILVER

5/9

American type, British made A.C. ELECTRIC PAINT SPRAYER

Just plug in and spray. Easier than a brush—twice as fast. **75/-**. Post 2/-

RADIO **BULLS** VALVES

246 HIGH ST. HAMPTON, MIDDX.

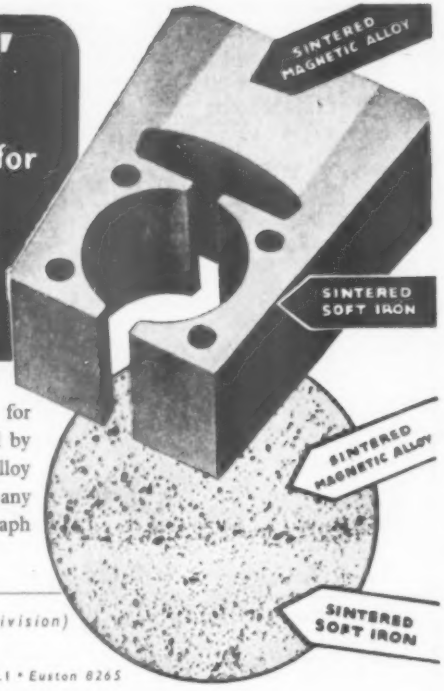
(Kindly mark envelope W.W.12)

'SINCOMAX'

is the registered trade name for

MUREX SINTERED COMPOSITE MAGNETS

Regd. Trade Name No. 707978

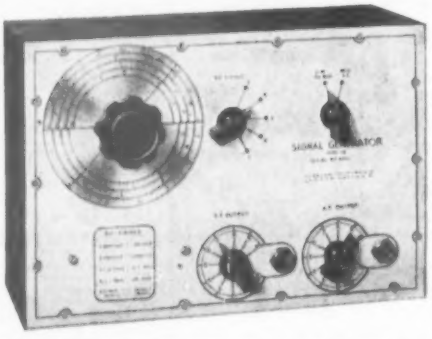


The Trade Name SINCOMAX has been registered for the Sintered Composite Magnets which are manufactured by Murex Ltd. The soft iron pole pieces and the magnetic alloy are pressed and sintered as an integral unit thus avoiding any loss of the flux between magnet and pole. The photomicrograph inset shows this transition area magnified 12 times.

MUREX LIMITED *(Powder Metallurgy Division)*

RAINHAM • ESSEX • *Rainham, Essex 3322*

London Sales Office: Central House, Upper Woburn Place, W.C.1 • *Euston 8265*



SIGNAL GENERATOR TYPE 10. 100 Kc/s-100 Mc/s

Price £7 . 10 . 0

The accuracy, reliability and comprehensive specification, are some of the reasons why the *TYPE 10* has achieved such outstanding success.

● *100 Kc/s to 100 Mc/s* ● *Modulated or unmodulated carrier* ● *Direct calibration* ● *Adjustable 400 c.p.s. AF signal* ● *Stable RF oscillator* *Large, easily read scale* ● *AC mains operation*

New instruments now available include the *HOMELAB CHECKTEST* price 37/6d., and a range of accurately calibrated variable condensers, 100pf., 500pf., and 1000pf. price 42/- each

Obtainable only direct from the manufacturers. Send for full technical details or call at address below.

Overseas enquiries invited.

HOMELAB INSTRUMENTS LTD.,

615-617, HIGH ROAD, LEYTON, LONDON, E.10

Telephone LEY 5651

M. R. SUPPLIES, Ltd.

offer only material which is brand new or in otherwise perfect condition. Immediate despatch—safe packing—satisfaction assured. All prices nett.

FRACTIONAL H.P. MOTORS. Shaded pole types, 200/250 v. A.C. Hoover, torque 150 gm/cms, 950 r.p.m., 26/- (des. 1/6). Ratrin, torque 500 gm/cms, 1,200 r.p.m., 42/6 (des. 1/6). Fracmo, universal A.C. D.C., 230 v., 1/75th H.P., 2,000 r.p.m., 37/6 (des. 1/6). B.T.H. Projector Motors (suitable for many other purposes), 1/10 v. A.C. comp. ind., 1/20th H.P., 18/6 (des 1/6). Also **G.E.C. ONE-THIRD H.P. MOTORS**, 190/250 v. 50 c. 1 ph. Cap. Ind. ball-bearings, cont. rated, for mounting horizontally or vertical, 1,440 r.p.m., **66/18/6** (des. 3/-). Also **GEARED MOTORS** (mostly Higgs). Induction, 220/240 v. 50 c. 1 ph., 1,425 r.p.m. geared down to 80 r.p.m., prime power 1/3rd h.p., **66/15/-** (des. 3/-).

STUART CENTRIFUGAL PUMPS from stock. The NEW No. 18 motor/pump unit with 230/250 v. Induction motor, head 5/15 ft., 720/400 g.p.h. The perfect unit for continuous duty and minimum maintenance, no radio interference, quiet running. **£11.15/-** (des. 5/-). Most other models in stock—please enquire.

SELENIUM RECTIFIERS (S.T.C.). We claim to have the largest stock of High Duty Rectifiers in London—almost every normal requirement can be immediately met. Examples: Funnel-cooled full-wave Units (no forced draught required). Any single unit, **£4/10/-** nett (despatch 2/6). For D.C. delivery of 36 volts 20 amps, 24 volts 20 amps, 30 volts 10 amps, 72 volts 10 amps (all single Units). Also 108 volts 10 amps, 150 volts 10 amps, 36 volts 40 amps, 24 volts 40 amps, 50 volts 20 amps (all pairs, **£9 pair nett**—des. 5/-). Also 220 volts 10 amps, 190 volts 30 amps (four Units, **£18 the four**—des. 10/-). Also 12 volts 80 amps, **£5/10/-** (des. 2/6). All Units new and guaranteed and offered at about half normal nett price.

VARIABLE TRANSFORMERS. First-class units by Philips, saving expense and delay. Input 220 v. 50 c. Output infinitely variable 0/260 v. Bench type—fully enclosed, brand new. Loading 520 VA, **£8.15/-** (des. 6/-), 1040 VA, **£14/15/-** (des. 7/6), 2080 VA, **£19.17/6** (des. 7/6). **BOOSTER TRANSFORMERS** (G.E.C.), 190/230 v. in 10 v. taps. Loading (continuous) 4 kVA. In steel housing 16in. high overall, 8½in. × 12in., with handwheel selector, **£11/10/-**, carr. paid England.

TUBULAR HEATERS, 220/240 v. 240 watts. Length 4ft. Very efficient for the low consumption and ideal for laboratories, workshops, greenhouse, lofts, garage etc. Good tax free bargain, **29/6** (des. 3/6 each).

THERMOSTATS, ex-A.M., for frost protection, on at 32 deg. F., off at 49 deg. F. (adjustable), capacity 1.5 amp at 250 v., **4/6** (des. 4d.). Also Capillary type, tube 5ft. long, with 3in. phial, range 35/90 deg. F., capacity 5 amps, for air or immersion, **17/6** (des. 1/6). Also Room type, and for greenhouse, etc. Range 40/80 deg. F., diff. 1 deg. F., capacity 10 amps A.C.; with manual on-off switch, **45/-** (des. 1/-).

CONTACTORS for 230/250 v. A.C. operation. Switching: 3-pole "make," 10 amps. Mounted on base 6½in. × 4½in., with cover, **18/6** (des. 1/-).

SYNCHRONOUS ELECTRIC CLOCK MOVEMENTS, 200/250 v. 50 c. Fitted spindles for hours, minutes and seconds hands, ready for use. In plastic dust cover 3½in. dia. × 2in. deep, with flex, **27/6** (des. 9d.). Set of three hands to suit 5/7in. dial, 2/-.

G.E.C. MINIATURE CRYSTAL CALIBRATORS. Continuation of this remarkable offer. Operation 200/250 v. A.C. For frequency calibration in 100 Kc. steps from 100 Kc. to 10 Mc/s. Modulation at 400 c/s switched in if desired. With vacuum mounted crystal, basic 100 Kc. Accuracy 0.001 per cent. Size 8½in. × 6½in. × 2½in. Brand new 12 guinea instrument for **£5.5/-** (des. 2/-).

SMALL BLOWER ASSEMBLIES (for attaching to own motor). With 15 vane, impeller, housing approx. 5½in. × 4in., **3/6** each, **40/- doz.**, carr. paid.

IN STOCK: Sangamo Synchronous Devices, B.P.L. Measuring Instruments, Lighting Dimmers.

Rail despatch charges relate to England and Wales only.

M. R. SUPPLIES Ltd., 68 New Oxford Street, London, W.C.1

Telephone: MUSeum 2958

A Professional
TAPE RECORDER
for only 32 gns!

THE REMARKABLE BURGOYNE DUAL TRACK TRANSPORTABLE TAPE RECORDER

We are proud to offer to-day's greatest value in tape recording—built to professional standards and giving greater reliability and performance. Now being demonstrated at the Radio Centre, where you can see, and hear also, the latest in high fidelity equipment.

- **64 mins. playing time from a standard 7in. reel—dual tracks.**
- **Fast forward and rewind.**
- **Frequency response 30-9,000 c/s. at 7½in. per second (checked on Decca K1804 Frequency test record).**
- **Instantaneous braking of tape reels.**
- **Record Playback changeover switch with visual indication of position.**
- **Supplied with Rothermel high fidelity crystal microphone.**

Three heavy duty motors to obviate use of friction drives. Erase and bias frequency 50 Kc/s. Power consumption approx. 80 watts. Output 4 watts. All controls and inputs mounted on front of cabinet on handsome escutcheon plate. Volume control and on/off switch. Bass treble controls for cut and boost operative on both record and playback. Separate radio and microphone inputs.

All accessories by Burgoyne, Lane, Rothermel, etc., are available separately as advertised.

Head lift transformer improving signal/amp. noise ratio. Speaker muting switch obviating feed-back between microphone and speaker. High grade P.M. speaker. Ext. speaker sockets. Switching provided for use of amplifier as straight gramophone amplifier for high quality reproduction. Handsome polished walnut cabinet overall dimensions 21in. × 13in × 13in.

We recommend high coercivity tape by Burgoyne for use in this Recorder 1200/ft. spool 35/-; 600/ft. spool 21/-.

PRICE 32 Gns. with crystal microphone or H.P. terms £11.4.0 deposit and 12 monthly payments of 42/9. Carr. and packing 21/-.

DON'T take our word for it—come and HEAR this amazing instrument!

M·O·S

MAIL ORDER SUPPLY COMPANY

The Radio Centre

DEPT. W.W., 33 TOTTENHAM COURT ROAD, LONDON, W.1. MUSEUM 6667

Introducing the RONETTE

MINIWEIGHT CRYSTAL PICK-UP

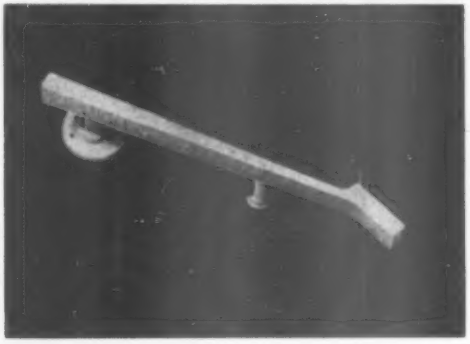
A new high fidelity pick-up now available for the first time on the British market, of marked superiority and at a low price. The Miniweight uses interchangeable crystal cartridges for 78 R.P.M. and Long Playing,

WITH A RESPONSE UP TO 7,000 c/s

RONETTE
Miniweight Xtal Pick-up with one head (Standard or L.P.)

68/6

Std. or L.P. HEADS only **36/-** each

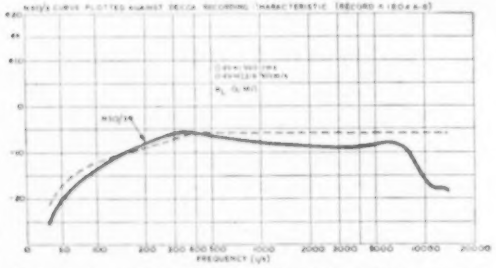


RONETTE
Miniweight Xtal Pick-up with two interchangeable heads for Std. and L.P.

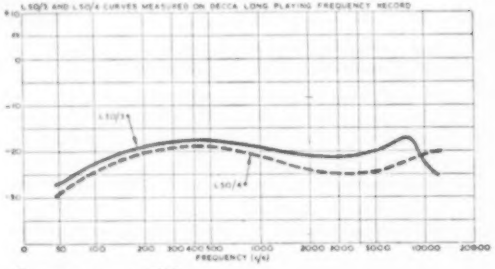
99/6

The Miniweight has an extremely light-weight, ivory plastic pick-up arm of scientific design and pleasing appearance. The cartridge holder is offset for minimum tracking error, and cartridge changing is simple.
Curves for Ronette pick-ups are printed below.

Standard Head



L.P. Head



The voltage average of "RONETTE" Miniweight cartridges, measured by using normal records shows following figures :

Load-resistance	Standard Head N 50/3	L.P. Head L 50/3	
250,000 Ohms	0.9	0.18	Volts (r.m.s.)
100,000 Ohms	0.6	0.13	
50,000 Ohms	0.3	0.08	

These being average voltages, peaks occur to even more than twice these values.

Temperature max. : 40°C.
Element capacity : 2,000$\mu\mu$F.
Extremely low needle pressure eliminating record wear : 7½ grams.
Moving Mass : 0.0016 grams.
Effective moving mass at 1,000 c/s. : 0.04 grams.
Tested with Decca Frequency Record K18J4 A.B. within 1.5 db.

Frequency response up to 7,000 c/s.

Net weight: 2¾ oz.

FOR THE TECHNICALLY MINDED USER

AS YOU probably know, the load-resistance provided by the amplifier or radio-receiver across the pick-up has a great influence upon the frequency-voltage characteristic.

As a rule when using older type sets and amplifier-loudspeaker combinations some bass boost is desired, this being provided for by using a load-resistance between 0.25 and 0.5 M/ohms.

By using 0.1 M/Ohms the output voltage is substantially linear, e.g., dependent of the loss in amplitude below the turnover point between 300 and 500 c/s. (For N50/3 cartridge.)

SOLE DISTRIBUTORS FOR GT. BRITAIN

E. & G. DISTRIBUTING CORPORATION LTD.

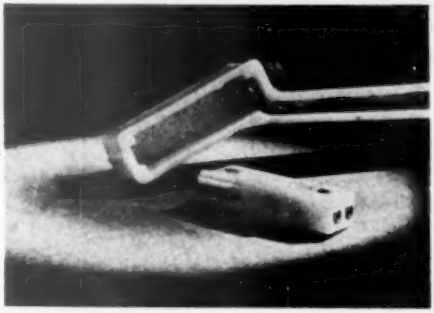
33 TOTTENHAM COURT ROAD, LONDON, W.1

MUSeum 6667 Wholesale and Retail Trade Enquiries Invited

Sole Distributors for
BURGOYNE
MAGNETIC RECORDING TAPE TABLES.
OSCILLATOR COILS, ETC.

M·O·S

Sole Distributors for
BURGOYNE
MAGNETIC RECORDING HEADS
39/6 EACH.
RECORD-PLAYBACK OR ERASE.



RONETTE MINIWEIGHT
CRYSTAL PICK-UP

FIRST and **FOREMOST**

We have pleasure in announcing immediate delivery from stock of the NEW RONETTE Miniweight Xtal Pick-up for high fidelity recordings, as described in this issue. With a frequency response of up to 7,000 c/s this pick-up will ensure the best reproduction of the now extensive range of LP recordings recently enlarged by the EMI issue.

RONETTE PICK-UP With interchangeable L.P. and standard heads, **99/6**
H.P. TERMS:
Deposit 33/2 and 12 monthly payments of **8/8**

RONETTE PICK-UP With 1 head (Std. or L.P.), **68/6**
H.P. TERMS: Deposit 23/- and 12 monthly payments of **6/10**

PICK-UP HEADS (Standard or L.P.) **36/-**

For the discriminating listener—

THE BURGOYNE 3 SPEED RECORD-PLAYER

Outstanding in appearance this high fidelity unit incorporates the famous BSR type GU4 gramophone unit with lightweight crystal head.

Special features of this unit are the automatic stop operating on all types of records, 33⅓-45-78 r.p.m. speeds by switching and the high fidelity pick-up. The cabinet is of a beautifully polished walnut streamlined design.

LIST PRICE **13 gns.**

or H.P. Terms **91/-** deposit and 12 monthly payments of **18/6**

For use on all voltages 100-250 v. AC 50/60 c/s.

These handsome polished walnut cabinets are available to fit your own GU4 motor at **70/-**

Also available without cabinet as the GU4 TOH motor unit complete with pick-up, **£9/19/11**. H.P. terms, 66/11 deposit and 12 monthly payments of 14/5.

A NEW HIGH FIDELITY

MAGNETIC RECORDING TAPE

Introducing the BURGOYNE High coercivity TAPE. Pure reproduction equally in the high notes and the low notes; ample volume, no sound distortion even at high modulation—perfect recording and perfect reproduction, thanks to—

★ A very wide frequency range.
★ Almost complete absence of ground noise.
★ High sensitivity.

Specially imported by us to meet the demand for a really high fidelity tape.

SPECIFICATION.

- Coercivity, 250 Oersteds.
- Remanence, 500-700 Gauss.
- Signal to noise ratio depends upon recorder used, may exceed 65 db on a given signal, 2 per cent. harmonic distortion.
- Erasing: minimum 70 db.
- Uniformity on one reel tape ± .5 db.
- Uniformity on two different reels tape MAX. .2 db
- Frequency response 3¾in./sec. 50-6,000 c/s. 7½in./sec. 50-8,500 c/s. 15in./sec. 30-12,000 c/s.

1200' SPOOLS **35/-** SPARE 1200' **4/6**
600' SPOOLS **21/-** SPOOLS 600' **3/-**

SPECIALLY RECOMMENDED FOR USE IN THE **BURGOYNE TAPE RECORDER** DESCRIBED IN THIS ISSUE

Trade Enquiries Invited.

The BSR GU4 is also available fitted with Decca interchangeable heads used for the XMS Pick-up, the lightweight pick-up arm having a special adaptor.

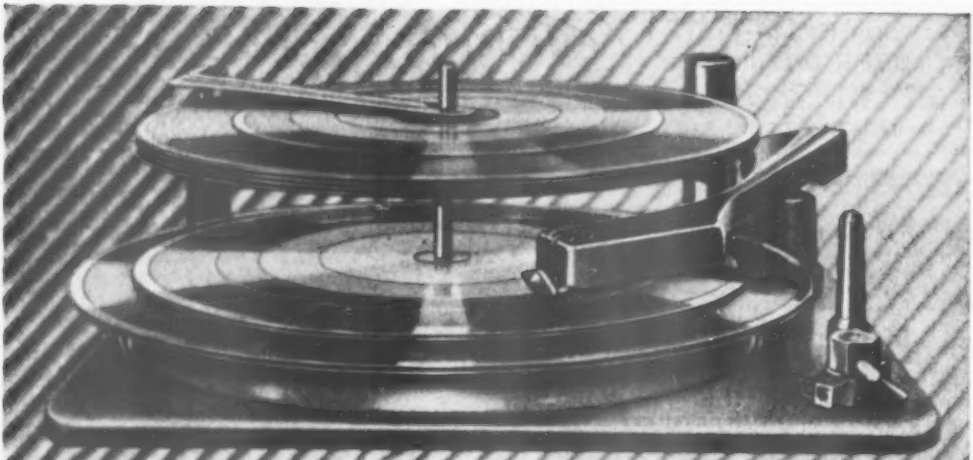
GU4 complete with adaptor but less pick-up heads, Cash **£8-0-8d.**
or £2/13/8 Deposit and 12 monthly payments of 12/3.

Decca XMS heads, red for 33⅓ r.p.m., brown for 78 r.p.m., £2/19/2 each.

GU4/DEH complete with 2 Decca heads, **£13/19/-** Cash, or **£4/15/-** Deposit and 12 monthly payments of **18/9**

M·O·S

E. & G. **MAIL ORDER SUPPLY CO.**, *The RADIO CENTRE*
MUSeum 6667 **Dept. WW, 33, TOTTENHAM COURT ROAD, LONDON, W.1.**



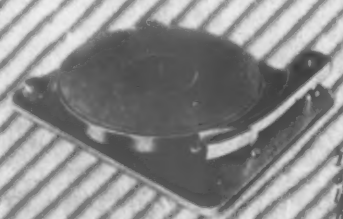
A record achievement

Discriminating listeners and manufacturers alike have acclaimed the Monarch auto-changer. Its unusual new features, its ease and simplicity of operation and its high standard of reproduction and performance have proved it a masterpiece in design and technical excellence.

Note these outstanding features.

★ Automatically selects and plays 7", 10" and 12" records, intermixed, at 33⅓, 45 or 78 r.p.m. Capacity, 10 records.
★ New record change mechanism virtually eliminates pause between records.
★ New reversible dual stylus crystal pick-up has extended frequency range to 10,000 c.p.s. Self compensated for the L.F. lower frequencies with the Turnover frequency at the correct point.
★ Pick-up automatically returned to rest position and motor switched off after last record.
★ Remarkably compact design makes it an ideal unit for the Radiogram/TV. combination console.
★ Simplicity of design guarantees long life and trouble-free operation.
★ Beautiful styling and finish that will harmonize with any cabinet design.
★ Operates on 100/125-200/250 volts, 50 cycles A.C. Models also available for 60 cycles A.C.

BSR



The REGENT a beautifully styled three speed gramophone. Complete with ingenious automatic stop and light-weight high-fidelity turnover-type crystal pick-up fitted with two permanent sapphire styli.

Birmingham Sound Reproducers Ltd., Old Hill, Staffs. England. Grams. 'Electronic Old Hill, Cradley Heath.'

Wireless World

RADIO, TELEVISION AND ELECTRONICS

42nd YEAR OF PUBLICATION

Managing Editor : HUGH S. POCOCK, M.I.E.E.
Editor : H. F. SMITH

DECEMBER 1952

In This Issue

EDITORIAL COMMENT 479
DEFLECTOR COIL CONSTRUCTION. By *W. T. Cocking* .. 480
" ALL-DRY " SIGNAL TRACER. By *E. J. Faulkner* 487
ETCHED CIRCUITS 488
RADIO-CONTROLLED JET PLANE 489
METAL CONE LOUDSPEAKER—2. By *F. H. Brittain* .. 490
LETTERS TO THE EDITOR 493
BOOKS RECEIVED 494
WORLD OF WIRELESS 495
REDUCING FIRE RISKS. By *F. R. W. Strafford* 499
FLAT TELEVISION MAGNIFIER. By *N. A. de Bruyne* 502
MICROPHONY IN SUPERHET OSCILLATORS. By *H. Stibbé* 504
SOLDERING TECHNIQUE 507
TWO-RANGE TEST OSCILLATOR. By *H. B. Dent* 508
LOW-LEVEL MODULATION 512
TELEVISION BOOSTER STATION 514
ELECTRON-COUPLED OSCILLATORS. By " *Cathode Ray* " .. 515
V.H.F. RADIO. By *E. G. Hamer* 519
DRYING OUT TRANSFORMERS. By *J. MacIntosh* 523
MANUFACTURERS' PRODUCTS 525
RANDOM RADIATIONS. By " *Diallist* " 526
UNBIASED. By " *Free Grid* " 528

PUBLISHED MONTHLY (last Tuesday of preceding month) by ILIFFE & SONS LTD., Dorset House, Stamford Street, London, S.E.1. *Telephone:* Waterloo 3333 (60 lines). *Telegrams:* " Ethaworld, Sedist, London." *Annual Subscription:* Home and Overseas, £1 7s. 0d. U.S.A. $4.50. Canada $4.00. BRANCH OFFICES: *Birmingham:* King Edward House, New Street, 2. *Coventry:* 8-10, Corporation Street. *Glasgow:* 26b, Renfield Street, C.2. *Manchester:* 260, Deansgate, 3.

the rate at which product design advances towards perfection is largely dependent upon the availability of research facilities and the flexibility of manufacturing methods.

Both these conditions exist in a very high degree in the Mullard organisation, and this is reflected in the outstanding qualities of Mullard television tubes. The efficiency of Mullard tubes has always been acknowledged, and years of proved performance in hundreds of thousands of receivers have justified the epithet "Long Life TV Tubes".

this achievement in the design of a highly technical and complex device has played an important part in raising television reception to its present high standards. It has also helped to influence the public in its choice of receivers since this considerable reputation for reliability is an added inducement to invest in good sets.

Mullard

LONG-LIFE TV TUBES

MULLARD LTD · CENTURY HOUSE
SHAFTESBURY AVENUE · LONDON

MVM 211

Wireless World

DECEMBER 1952 VOL. LVIII. No. 12

A Queer Committee

LAST month, in reporting that the Television Advisory Committee was to be reconstituted to deal with the problems of v.h.f. sound broadcasting as well as vision, we suggested this body might well take on much greater importance than hitherto. Progress on medium frequencies is at an end; the future lies within the bands above 30 Mc/s, and, that being so, the T.A.C. will ultimately assume responsibility for advising the Postmaster-General on the technical and organizational development of *all* broadcasting.

Since then, the facts about the new T.A.C. have been announced by the Postmaster-General. The terms of reference are wide, but pretty much as expected: "To advise the P.M.G. on the development of television and sound broadcasting at frequencies above 30 Mc/s and related matters, including competitive television services and television for public showing."

The Chairman of the new Committee is Admiral Sir Charles Daniel, and there are nine members. With seven of them we are not especially concerned, except to say that most of them will probably have to lean heavily on their technical advisers—surely not an ideal state of affairs. They are Sir Edward Herbert, the Hon. Charles McLaren and E. M. Fraser, all with wide experience in industry; Sir Ian Jacob, Director-General of the B.B.C., and an as-yet-unnamed senior official from the Treasury, the Ministry of Supply and the Post Office. It is with the remaining two members, G. Darnley Smith and C. O. Stanley, of the Radio Industry Council, that we are here mainly concerned. We will consider first the suitability of Mr. Stanley.

One of the first things the T.A.C. has to advise upon are the characteristics of the proposed v.h.f. sound service, which must include the system of modulation. Mr. Stanley and members of his firm (Pye, Ltd.) have for years expressed strong and uncompromising opinions in favour of amplitude modulation. These opinions, though they conflict with those of the majority, may possibly be right; at any rate, *Wireless World* has given much space to the airing of them. But that is not the point; Mr. Stanley is on record as having pre-judged an important issue on which the T.A.C. has to make up its mind. And more, he is one of the moving spirits of the Associated Broadcasting Development Company, a firm recently formed in the hopes of being able to set up, among other things, a television service in competition with the B.B.C. Is Mr. Stanley, then, to take part in advising the P.M.G. on the highly controversial issue of the conditions under which his own company should be licensed?

And so with Mr. Darnley Smith, chairman of the Radio Industry Council, who is managing director of Cinema Television. Though this firm does not operate cinemas which might seek licences from the P.M.G., it is part of the J. Arthur Rank organization and has, in fact, already developed big-screen projection television apparatus to a high state of excellence. Mr. Darnley Smith has an obvious—and at present unique—interest in this field.

Wireless World has studied the composition of advisory committees in general, and can find nothing approaching a precedent for the state of affairs to which we are now drawing attention. Industrial or commercial interests are not necessarily a barrier to membership; on the contrary, they are sometimes a qualification for it. But the positions of Mr. Darnley Smith and Mr. Stanley, as heads of firms with unique specialist interests, are quite exceptional, and service on the T.A.C. would subject them to criticism that they should not be asked to bear. Their position is made still more difficult by the fact that, although the P.M.G.'s statement implies that they represent the Radio Industry Council, we are given to understand that they serve in their personal capacities.

Wireless World does not question the integrity, altruism or capabilities of Mr. Darnley Smith and Mr. Stanley. Indeed, we cannot think of any better representatives for the industry on an advisory committee dealing with almost any other subjects. But we feel they have both been shanghaied into T.A.C. at short notice and without mature consideration, and should be allowed to resign with honour. Harm has already been done to broadcasting by throwing it into the party-political arena. More harm may be done if dissensions within the industry are provoked by the Government's choice of unsuitable industrial representation on the T.A.C.

Deflector Coil Construction

Method Using Simple Jigs

By W. T. COCKING, M.I.E.E.

IN the course of experimental work, the writer has had occasion to make quite a number of deflector-coil assemblies and has tried a good many different ways of doing it. Some of these proved more satisfactory than others and it is considered worth while to record the one which proved the best.

The basic method is to wind a flat slab coil and then bend it to the required final shape. A special winding former and bending jig are necessary and it is essential to keep these as simple as possible. Elaborate tools are justified only when large numbers of coils are to be made.

A complication is brought about by the fact that the line and frame coils are not alike. However, with a little care in design it is possible to use the same winding former for both. The jig can be made to do for both also by making a part of it adjustable.

The winding former consists of two pieces of sheet brass, spaced apart by a centre piece 2.1 mm thick and measuring 1 in by 1½ in. Its function is only to space the cheeks correctly and so the only important dimension is the thickness. The two cheeks measure 4½ in by 2¼ in and can be of any convenient thickness; the thicker they are the better, since they will be stiffer.

The two cheeks and the spacer are bolted together and have a centre hole through which a spindle can be passed. Holes are drilled through both cheeks at suitable points and carry pins, over which the wire is wound. Four pins are inserted initially and the wire for the first section of the coil is run on, then four more pins are inserted and the next section is wound and so on.

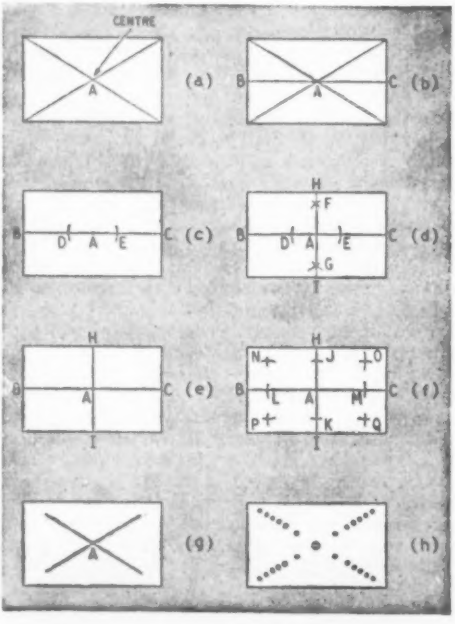
By doing this, the sections can be kept close together for the sides of the finished coil but spaced apart for the ends. In the final bending process these ends are drawn together. Each section can be tied together during winding and it has been found advisable to make the winding depth of each section equal to the winding thickness. Tying the sections then holds them firmly whereas, if the depth and thickness differ greatly, it does not.

It is essential that the holes for the pins should be accurately positioned and very careful marking out and drilling are necessary. The best procedure is to true up the two cheeks with a file and to find the centre by drawing two diagonal scratch lines between the corners. Lightly centre punch their crossing, see (a) Fig. 1. Draw a scratch line BC parallel with the long edges through this centre A (b). From now on, all marking off is done with a pair of dividers from this horizontal line and the centre. Set the dividers for a radius of about 20 mm and with centre A describe arcs cutting BC at D and E, (c). With centres D and E and any convenient radius draw arcs intersecting at F and G, (d). Draw a scratch line through F and G. If the setting out has been carefully done, this line will be at right angles to BC and will pass through A. It is labelled HI.

For clarity in the sketches, the setting-out lines are now ignored and we start now with the lines BC and HI intersecting at right angles at A, as shown in (e).

It is now necessary to mark out diagonal lines at 31° to the horizontal BC. To do this, describe arcs with centre A and radius 24 mm cutting HI at J and K. Describe arcs with centre A and radius 40 mm cutting BC at L and M. Then with centres J and K and radius 40 mm and with centres L and M and radius 24 mm describe arcs intersecting at N, O, P and Q. Draw scratch lines through NQ and OP. These should cross at the centre A. The construction is shown at (f) and the resulting diagonal line at (g).

Fig. 1. These drawings illustrate the marking out procedure for the cheeks of the winding former. The dimensions are given in the text.



With centre A and radius 30 mm describe arcs cutting these lines, repeat with radii of 36, 42, 48 and 54 mm. This gives the positions of the 20 holes for pins. Describe similar arcs with a radius of 18 mm to give the positions of four holes for clamping the cheeks and core together. Carefully centre punch all 24 points and drill the centre and the four clamping holes 8 BA clearance. The clearance must be tight, not loose; the correct drill is a No. 42. Drill a centre hole through the second plate and clamp the two plates together with a centre screw and nut; then, using the first as a template, drill the second for the four clamping holes. Screw the two together with four 8 BA screws and nuts.

Then drill both plates together for the remaining 20 holes with a 5/64 in drill. Separate the plates and lightly countersink all holes to remove burrs. Drill a centre hole in the spacer and screw it to the original marked plate and drill the four clamping holes 8 BA. Clamp all three pieces together by the four screws and enlarge the centre hole to the correct size for the winding spindle, 2 BA is usually convenient.

Clamp the two plates together and put four saw-cuts down each long edge to just below a line joining the inner holes for the pins. These are to enable the coil to be tied up while in the former. Separate the plates and remove all burrs. The three parts now have the form of the sketch of Fig. 2. With a flat-faced punch, turn the corners of the edges of the saw-cuts outwards very slightly to prevent the wire from catching on them when winding. Only the corners which face the wire need to turned. Carefully polish the inside faces of the plates.

The 20 pins required should be ½ in long or more and are conveniently cut from steel knitting needles. Gauge 15 is suitable and is a loose fit in the holes. The pins must be quite smooth and the cut ends must be free from any burrs.

For winding, the former is best supported on a length of 2 BA rod in a hand-drill clamped in a vice or a lathe. A revolution counter is convenient but not essential. Before starting to wind, place lengths of sewing cotton about a foot long through each pair of saw-cuts so that they lie across the former parallel to the spindle. The ends can be twisted round the spindle, to keep them out of the way while winding, and held to the spindle by pieces of wire wrapped round. Insert four pins in the inner holes.

Fig. 3 shows the assembled former with the first four pins inserted and the eight lengths of cotton ready for winding. Now bring the wire into the former through a saw-cut and wind on the proper number of turns for the first section. Then free the ends of the cotton and tie up the section with a double knot on each cotton. Bring out the cotton ends again, insert four more pins in the next holes, and continue winding. Continue in this fashion, tying up each section when it is wound, until the coil is finished.

To remove the coil, take out the winding spindle and then pull out all pins. On the first diagonal they will be tight because of the tension of the wire, hence the need for smooth pins if the enamel of the wire is not to be damaged. The other three corners will be quite free, however. Then unscrew the four nuts holding the former together and remove one cheek. The coil then has the appearance shown in Fig. 4 and can be lifted off.

Usually, the wire gauge must be changed at intervals during winding. The join must always come at one of the short sides of the coil which will form the bent-up

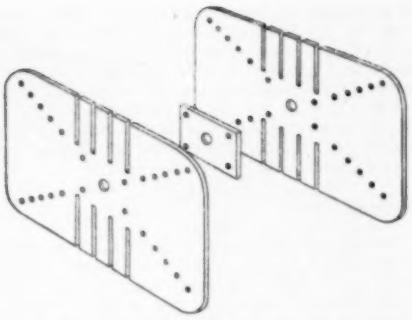


Fig. 2. This sketch shows the three parts of the winding former.

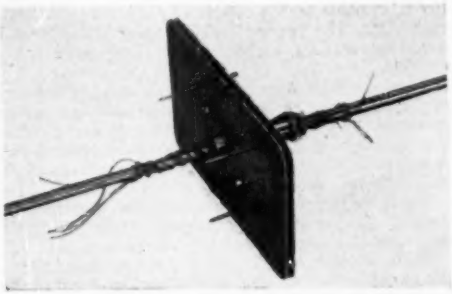


Fig. 3. The winding former is shown here assembled and with four pins inserted ready for winding. The eight lengths of cotton for tying up the coil are also in place with the ends wrapped round the spindle and held to it by a turn or two of wire.

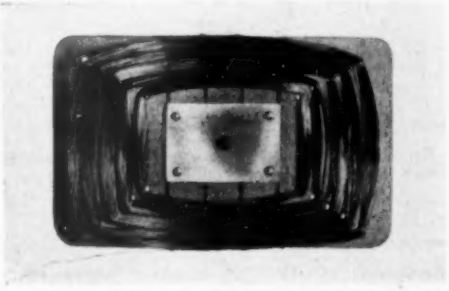


Fig. 4. The coil with one cheek of the former removed is shown here.

ends of the finished coil. Cut the wire so that the end will lie down in the former just beyond the middle and scrape the enamel off for half an inch. Similarly, bare the end of the new wire and slip an inch length of thin sleeving over it. Tin the ends of both wires, twist them together and solder. Slip the sleeving over the junction and continue winding. Where there are two junctions in a coil arrange for one to come at one end and the other at the other end of the former.

Four coils are needed for the assembly and they are

all wound in exactly the same way. They form two pairs for the line and frame deflection and the two coils of each pair must always be identical. The two pairs, however, are not necessarily the same in turns or wire gauge. Details are given in Table 1.

When they are wound, the coils must be bent to the proper shape and a simple jig is needed for this. A second jig is needed for making the former and for assembling the four coils.

Former

For making the former and for the final assembly of the coils a wooden cylinder is needed. This must be of hard wood and must be precisely 35.5 mm diameter with a smooth, if not polished, surface. It should be about 12 in long and one end should be turned off square.

Clamp one end in a vice and wrap around it a single turn of thin paper overlapping about one-half inch. Fix it in place with a couple of rubber rings—one at each end. The paper should be quite thin; the kind used for making carbon copies in typewriting is suitable.

Then wind on over the paper an overlapping layer of 1-in gummed paper of the sort used for packing parcels. The paper should be wound with its gummed side *outwards* and the overlap should be about ½ inch. A length of 3 inches or so along the former should be wound in this way.

Then wind a second layer with the gummed side *inwards* starting at the opposite end to the first so that the turns all cross those of the first at an angle.

While winding, make sure that the gummed side of the paper is thoroughly wet so that it sticks properly.

Put the former on one side to dry for at least 24 hours. Then pull it off the cylinder with the paper lining and carefully remove the latter if it has stuck to it anywhere. Owing to the shrinkage of the paper while drying it will be a tight fit but no difficulty should be experienced in working it off.

Now slip the former over the wooden cylinder without any lining. It should be a loose fit. Leave one end projecting over the squared-off end of the cylinder and with a razor blade cut off the end of the former square against the cylinder. Do the same thing with the other end of the former so that the result is a very thin-walled paper tube 2 inches long with square cut ends.

Fig. 5. Illustrating the method of dividing a cylinder into segments by a strip of paper.

TABLE 1

Section	10 mH		20 mH		30 mH	
	Turns	Wire S.W.G.	Turns	Wire S.W.G.	Turns	Wire S.W.G.
1.	50	32	71	34	89	36
2.	27½	32	38½	34	48½	36
	19	30	27	32	31	32
3.	42	30	60	32	70	32
4.	12½	30	17½	32	20½	32
	20	28	29	30	30	30
5.	29	28	41	30	42	30
Total	200		284		331	

All wire enamel insulation.

Now again wrap a turn of thin paper over the wooden cylinder, this time with one end projecting beyond the end of the cylinder. Now work the former back on to the cylinder. It should be a really tight fit but, because the paper overlaps the end and it can be got inside the former, it can be got on quite easily. Work it on so that there is plenty of the cylinder on each side of it. Give the former three coats of shellac varnish, letting it dry between each.

The shellac will stick the paper to the former, but this does not matter. The thing to guard against is the paper sticking to the wooden cylinder for, if it does, it will be impossible to remove the former. It will only stick if too much shellac is allowed to get on the paper so that it soaks through it. Therefore, the ends of the former should be only lightly shellacked and any surplus on the paper should be wiped off at once.

After each coat of shellac, and before it is really hard, check that the paper has not stuck by grasping the former and rotating it with the paper on the cylinder. This will free any slight tendency to stickiness.

Bending Jig

A cylinder of hard wood about 12 inches long is needed for the bending jig. It must be 37 mm diameter and finished smooth. It is necessary to draw four longitudinal lines along the surface, two on the opposite ends of a diameter and the other two inwards from them by 45°.

If no proper instruments are available, the easiest way of marking out is as follows:—

Draw one longitudinal line as a reference base. This is easily done by placing the cylinder on a flat surface and then placing a ruler with parallel edges against both the cylinder and the flat surface. Care must be taken to hold the ruler firmly in contact with both along its edges. A pencil can then be run along its edge.

Take a strip of paper and place one end precisely on the ruled line. Wrap it tightly round the cylinder and make a pencil mark on it precisely where it overlaps the start.

Remove the paper and, by measurement, divide the marked length into two equal parts. Mark this point (2nd mark), Fig. 5. Divide one of these halves into four equal parts by pencil marks at 3, 4 and 5.

Wrap the paper around the cylinder again, placing the starting end precisely on the reference line and mark off on the surface of the cylinder opposite the end the 2nd, 4th and 5th marks on the paper.

Shift the paper a couple of inches or so along the cylinder and repeat. Join the marks.

It is now necessary to describe three pencil rings around the cylinder precisely. These are best done in the lathe but, if this is not available, they can be done by measuring from the squared end of the cylinder. One ring should be near the middle of the cylinder and the other two precisely 29 and 39 mm from the first ring.

The intersections of the lines are now marked off

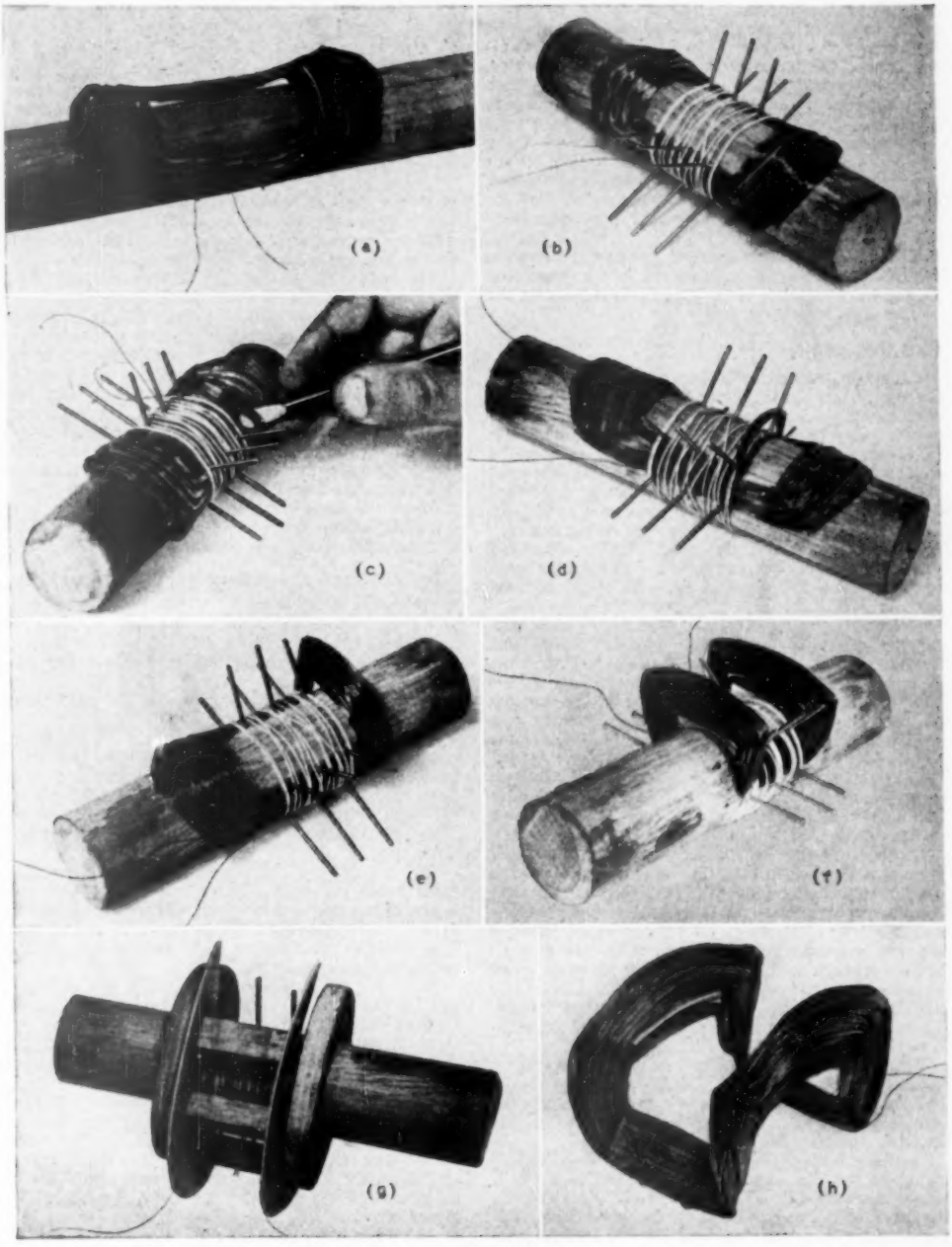


Fig. 6. A coil is shown at (a) with its initial simple bend around the cylinder, and a frame coil tied to the bending jig at (b). The start of the bending process is illustrated in (c) and the first section of a frame coil fully bent at (d). The coil with the whole of one end bent is shown at (e) and with both ends bent at (f). The bent coil with simple clamps for holding the ends flat while the shellac is drying appears in (g), while (h) shows one finished coil.

and drilled to take pins. The holes should be appreciably smaller than the pins so that the latter must be driven in with a hammer. As in the case of the winding former the pins can be cut from 15-gauge steel knitting needles. They should project about ½ inch from the former and to be firm they should enter it as much.

All these 12 pins must be precisely located if the finished coil is to come out true and to size. Four more pins, one on each line, must be inserted mid-way between those spaced 29 mm but as long as they are on the longitudinal lines their precise position does not matter.

The same jig is used for both line and frame coils, but the full 16 pins are used for the line whereas only 12 are employed for the frame, all four pins on the 39-mm ring being removed.

Coil Bending

Clamp one end of the 35.5-mm cylinder, which still has the former on it, in the vice. Place a coil on it with its long sides parallel to the axis so that it rests on its short sides. By hand, press down the long sides to rest on the face. This bends the short sides of the coil. It will spring back a bit, but this does not matter. In fact, this bending need not be accurately done, but it helps in positioning the coil in the jig. The coil so bent is shown in Fig. 6(a) on the cylinder.

All four coils can be done one after the other and this is a good plan, for all four must be bent the same way. The "way round" of the coils can be seen by the positions of the start and finish of the winding.

Now take the jig and clamp one end in a vice. Remove the pins from one inner longitudinal line. Take a coil and place one side between the two rows of pins and bend the other side down to meet the outer row of the other two rows. Then replace the pins of the inner row; there are three or four pins according to whether the coil is being bent as a frame or as a line coil.

Take a length of thick linen thread, run a slip knot in one end and slip it over coil and jig at about the middle of the coil; pull it tight. This will pull down the long sides of the coil on to the face of the cylinder.

Before going further, check that the inner section of the coil is centred on the pins. For the line coils the inside length of the long sides is slightly greater than the pin spacing and for the frame coils it is appreciably greater; it is necessary to have the distance between the pins and the corners the same at all four corners. If the distances are unequal they must be made equal by sliding the sides along the cylinder. Check also that the outer sections of the coil have not slipped. They can do so, since they are only tied together along these long sides.

When satisfied, bind the coil to the cylinder along its length with the thread. The binding turns should be ¼ inch or so apart and it is best to proceed from the middle to one end. Then place two turns tightly together just outside the four end pins.

Continue binding backwards with an open binding on top of the first, right to the other end of the coil, where there should again be two tight turns outside the pins. Continue back towards the middle and finish off by tying the end to one of the middle pins. A frame coil so tied to the jig is shown in Fig. 6(b).

During the binding process, it is necesary to bed down the wire between the pins with the thumb. It is necessary to make the wires fill the whole space between the pins. If left to themselves they will tend to bunch together towards the inner row of pins and this is especially the case towards the end of the coil. This tendency must be resisted and can easily be done by pressing the wires into place while binding.

Fig. 7. The end turns after bending should take the form shown here. This is important for the frame coils, but less so for the line.

The ends of the coil will spread longitudinally along the former, but this does not matter.

The bending can now be done. Take a smoothed surface tool, such as a blunt polished screwdriver or a similarly shaped piece of hard wood and slip it under the end turns of the first (inner) section of the coil at one end. Move it towards one end and lever upwards, as shown in Fig. 6(c), then to the other and lever. As soon as the wire is bent up enough to get hold of, use the fingers. The main bending must take place where the wires come out from the sides and here the wires should be bent sharply at right angles.

Shape the wire with the fingers so that both sides are alike and the wires bend away from the cylinder and the ends of the coil tend to the shape shown in Fig. 7.

Do the same thing with the second section, bending it up so that all its wires lie outside those of the first, and so on with all the others. The first section is the most difficult because the wires in it are the shortest. When one end is bent the coil should look like Fig. 6(e).

Then do the other end in exactly the same way. The coil will then be as in Fig. 6(f).

When satisfied with the bending, shellac the whole coil liberally, including the sides. Take two thin-card discs with holes to clear the cylinder and push them against the outer ends of the coils. Then put on two tightly-fitting wood blocks and push them home. These blocks should be a tight fit on the cylinder and quite solid.

Slip similar, but rather thicker and semi-circular, cards inside the ends. Three lengths of wood, one in the centre and one between each pair of pins can then be inserted to back up the cards, as in Fig. 6(g). The whole forms a simple clamp which squeezes the two ends simultaneously.

Leave for the shellac to dry. When the shellac is dry, but not hard, remove the wooden pieces and card. Unbind the coil, remove one inner row of pins and carefully remove the coil. It will stick to the cylinder slightly, but should come away quite easily with a little care, and appear as in Fig. 6(h).

The second line coil is made identical with the first.

The frame coils are bent in exactly the same way but using three pins (29-mm spacing between the outer ones) instead of four in each row. It is more important to get the coil initially centred than in the case of the line coils and it is very necessary to bend up the inner section so that the turns are normal to the face of the cylinder. Any cutting of corners must be avoided, otherwise the coils will not bed down properly over the line coils. All parts of the end *must* clear the cylinder by at least the coil thickness.

When all four coils have been removed, sleeve the leading-out wires and bring them all out on the turned-

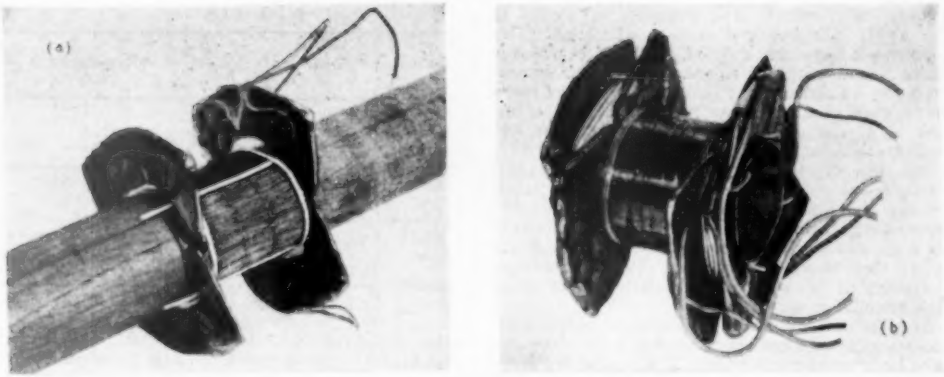


Fig. 8. A pair of line coils tied to the former is shown at (a). Note the lengths of p.v.c. string placed against the edges of the coils to insulate them from the frame coils. The assembly of four coils appears in (b) and the p.v.c. string wound between the ends of the line and frame coils can be seen at one end.

up ends, then tape the turned-up ends *only* with ½-in cellulose adhesive tape.

Assembly

The next step is to assemble the four coils. Mark four longitudinal lines on the 35.5-mm cylinder. The lines are to be 90° apart around the circumference and can be marked off by a strip of paper in the way previously described. These lines serve as guides in positioning the coils.

Place the former on the cylinder and then place the two line-scan coils on it, using rubber bands to hold them in place temporarily. Centre the coils longitudinally on the former and place them so that the adjacent edges of the two coils touch and coincide precisely with one pair of diagonally opposite lines on the cylinder. Place four lengths of p.v.c. string against the other edges then tie the coils tightly in this position by some four turns of linen thread at each end immediately adjacent to the turned-up ends. This is a permanent binding which is not removed, and the coils are now as shown in Fig. 8 (a).

Remove the rubber bands and tie the centre part down with a temporary open binding of thread. The two coils should now be quite firmly fixed to the former and yet not so rigidly that they cannot be moved slightly. Now position them very carefully so that the two sets of adjacent edges come very precisely over one pair of diagonally opposite lines on the wooden cylinder.

Now check the overall diameter of the assembly, not including the binding thread. It must not exceed 41.5 mm. If it does, apply methylated spirit to the longitudinal members of the coils to soften the shellac and then press the windings down with the thumb to spread the wire. No trouble will be experienced if the wires have been properly spread to fill the space in the bending jig. Any carelessness here, however, will result in the coil section being too thick at one part and too thin at another. Fortunately, quite a bit of correction is possible when assembling.

When satisfied, shellac the coils and former liberally and leave to set hard. When hard, remove the temporary open binding in the centre, leaving the close

Fig. 9. The complete deflector-coil assembly with its iron yoke.

binding at the ends. Place two layers of cellulose adhesive tape around the coil and former, bedding it down around the steps at the coil edges. This, together with the length of p.v.c. string, provides the insulation between the line and frame coils.

Now assemble the pair of frame coils in exactly the same way, but lining up the adjacent edges on the diagonal at right angles to the one used for the line coils. This lining-up is important for the raster will only be rectangular if it is carried out accurately. After assembly, shellac the coils thoroughly and leave to dry. Then place two layers of cellulose adhesive tape over the coils.

The next step is to wind p.v.c. string between the turned-up ends of the line and frame coils at each end to provide insulation between them. Care must be taken to bed the string down well for the first turns and the winding need be carried only far enough to prevent any possibility of the line and frame coils

coming into contact. The assembly is shown in Fig. 8 (b). The iron yoke must now be fitted. This comprises a 1-in stack of M. and E. No. 134, 0.014-in, Silcor 3, laminations. These are semi-circular laminations and are conveniently held in a light metal frame of tin plate or brass. The internal diameter of the iron is 42 mm and it should fit around the coil assembly without any great pressure.

The final step is to finish off the coil leads on to a six-tag board which it is convenient to fit to the frame holding the iron yoke. In each pair of coils the adjacent edges, which in winding were the outsides of the coils, must be joined together and it is necessary to join them at one accessible tag, since it is desirable to connect to this point in some circuits. The complete assembly is shown in Fig. 9.

In order that the direction of winding may be continuous when adjacent edges are thus joined, one coil must be reversed in assembly. This is obtained automatically if all coils are wound and bent in the same way. If a mistake is made it cannot be corrected by reversing the leads, for this would bring high-potential points together and the insulation would be inadequate.

In each pair of coils if one starts at the inside of one and follows the wire round to the inside of the other one must proceed continuously in the same direction, so that the magnetic flux produced by one coil is additive to that produced by the other.

Tested in the manner described in "Deflector-Coil Characteristics," *Wireless World*, March, April and May, 1950, the LI^2 figure is 1.4 mH-A^2 for the line coils and 1.6 mH-A^2 for the frame with an R/L figure of 1.9 Ω/mH for line and 1.8 Ω/mH for frame. These are for a 53° tube at 5 kV.

Data on a number of coils constructed in this way are given in Tables 1 and 2. Table 1 contains winding data for coils of nominally 10, 20 and 30 mH inductance and Table 2 gives the measured figures. Line coils of all three inductances have been made but frame coils only of the 10-mH type. It is not considered practicable to wind frame coils by this method to a high-enough inductance to avoid the use of a transformer. The wire would be so thin that there would be a serious risk of a breakage in the bending process. It is convenient, therefore, to standardize on the 10-mH type for the frame and to choose the transformer ratio to suit the circuit.

For the line, the inductance needed depends very much on the circuit. 10 mH is again convenient in a heavily damped circuit with a transformer, and 30 mH is a suitable choice for an efficiency circuit without a transformer[1].

The efficiency figure of 1.4 mH-A^2 is directly comparable with one of 2.9 mH-A^2 for an earlier design[2] and represents a 100 per cent improvement in efficiency. It permits the final anode of the c.r. tube to be operated at 10 kV instead of 5 kV without increasing scan power.

Quite a number of coil assemblies have been made in the manner described. The construction has been found to be quite easy and no failures have resulted. The coils have been in use for nearly two years, and in this time only two breakdowns have occurred, and both were due to faulty construction. In one case, the connections to the line coils had been reversed in assembly so that the remote, instead of the adjacent, edges of the coils were joined together. This meant about 1,500 V peak between the adjacent edges. The surprising thing was that a breakdown did not occur at once, but only after some weeks of use. In the other case, a metal arm was soldered to the yoke frame of a complete assembly without removing it from the coils. The heating damaged the insulation and caused a breakdown.

Some individual assemblies of the 30-mH line-coil type have by now had about a year's normal use without any trouble at all. It is felt, therefore, that the design is a sound one and can be relied upon to give a reliable performance.

It should be pointed out that the grading of turns quoted in Table 1 represents a compromise between raster distortion and defocusing, and the results obtained depend also on the screen curvature of the tube. For any given type of tube there is a particular distribution of turns which gives a rectangular raster and another, usually different, distribution which gives an even focus over the raster. The flatter the face of the tube the greater is the difference between the two.

It is possible that, in the future, it may become necessary to design the deflector coils to meet the focus requirement and to correct the raster distortion by fitting small magnets around the face of the tube. This is hardly necessary yet and the turns distribution given represents an acceptable compromise between the two requirements. With tubes of the flatter type, such as the G.E.C. 6705A, there is very slight pincushion distortion and a very good focus over the screen. With tubes having a slightly more curved face, such as the Mullard MW 31-16, the focus in the corners is not quite so good, but the raster is nearer a perfect rectangle. The distribution can be regarded as a satisfactory one for most tubes of this general type.

As it stands, the design is not suitable for 70° tubes. These tubes have a slightly larger neck diameter and the coils must be shorter to avoid shadowing. The same principles of construction can be used, of course, but the dimensions of all formers and jigs would need alteration and the turns-distribution would be different. In addition the coils would have to be wound with thinner limbs to fit inside a standard iron ring.

It is unfortunate that deflector coil design must be largely empirical because it makes it rather a laborious process. Unless one is very lucky it is necessary to make at least three or four assemblies before one arrives at a satisfactory arrangement. The writer feels that he should give this warning to those who otherwise might rather light-heartedly set about a re-design for a 70° tube.

TABLE 2

Coil	Inductance (mH)	Resistance (Ω)
10mH Line	10.9	21
Frame	11.8	20.7
20mH Line	22	39
30mH Line	29.6	58.6

[1] "Simple Line-Scan Circuit," by W. T. Cocking, *Wireless World*, August 1952, pp. 305.
[2] "Television Receiver Construction," Parts 2 and 3, *Wireless World*, February and March 1947, pp. 40 and 103.

"All-Dry" Signal Tracer

Battery-operated Instrument for Fault Finding in Receivers

By E. J. FAULKNER

SIGNAL tracing as a method of fault finding in radio receivers appears to have been completely ignored in this country. There is practically no mention of it in any of our technical journals, nor in any of the various guides to radio servicing by British authors. It is fairly certain, however, that many servicing technicians in this country do use the technique in one form or another.

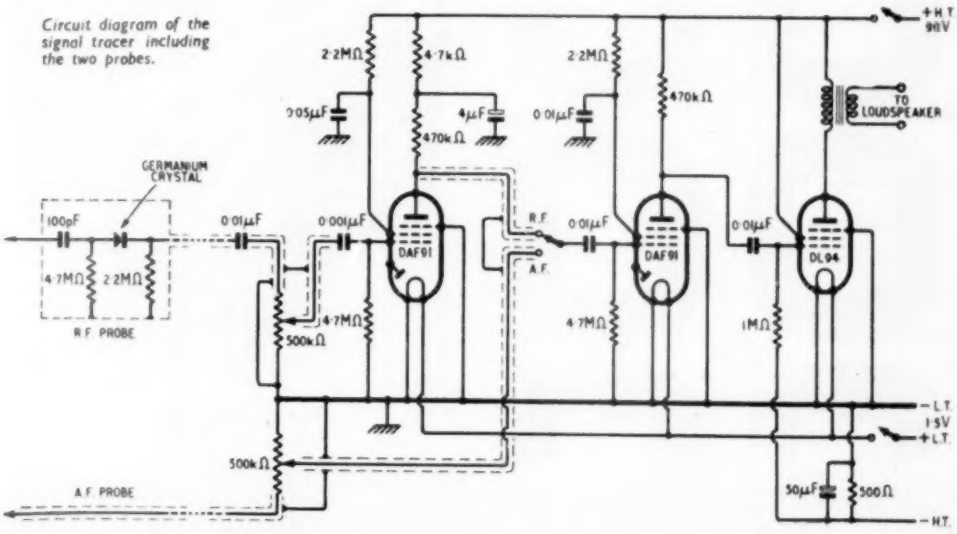
The procedure with signal tracing is the reverse of the normal servicing procedure adopted in this country. Our usual technique with the "dead" set is to work backwards from the output to the input, eliminating step by step the loudspeaker, a.f. section etc., to the first r.f. stage. The signal tracing method is to work forward from the input by injecting a suitable signal through successive stages to the output. The position of the fault is then indicated when the signal is lost.

The procedure recommended in American textbooks is to use a signal generator to inject the signal and a valve voltmeter as the signal tracer. When signal tracing is used by British servicing technicians on broadcast receivers, however, the usual practice is to make use of the broadcast signal and trace it through the set by means of a signal tracer. Essentially a signal tracer is nothing more than a suitably sensitive detector followed by one or two stages of a.f. amplification, with provision made for direct a.f. pick up to trace the a.f. signal past the receiver's detector stage.

Naturally there are advantages and disadvantages in both methods, but with the increasing use of new ranges of valves without grid top caps the author is beginning to find a signal tracer almost indispensable in servicing. Moreover, the particular signal tracer described here is proving itself most valuable when dealing with the compactly built radio chassis so prevalent to-day.

By using a germanium crystal and 1.4-V B7G-type valves, it was possible to dispense with the mains as a source of power. For the case an old instrument box was used, measuring overall 9½in × 6½in × 7½in. The chassis fitted into the lid, which was 2in deep, and the "all-dry" battery (B103 type) went into the main compartment. There was just room for the valves to fit in alongside the battery with the lid closed. The loudspeaker used was the normal workshop test speaker, and was clipped on to the contacts brought out from the secondary of the midget output transformer. The screened cable was ordinary 50-ohm television coaxial cable. The r.f. probe was made up in the cylindrical can of an old electrolytic capacitor, while the a.f. probe was fashioned out of a disused fountain pen. The valves used were Mullard types DAF91, DAF91 and DL94. An attempt was made to

Circuit diagram of the signal tracer including the two probes.



use a DAF91 for the r.f. probe (with the diode section in place of the germanium crystal) but this did not prove at all successful.

The author has found this signal tracer to be adequately stable and free from that plague of all such instruments—hum. Since bringing it into use there have been many examples in both sound and television receivers where it has solved some nasty headaches in a surprisingly short time. It has been particularly useful, for instance, with faults such as intermittent noise (due, in one case, to a paper capacitor just breaking down), and also in finding out where distortion was originating.

One great advantage in having the instrument battery-operated is when it is used for testing a.c./d.c. sets. There is no need to go through the tiresome procedure of electrical isolation which is such a bugbear with this type of receiver.

ETCHED CIRCUITS

IN November, 1946, we published a brief note on a new system of printed circuitry which consisted of printing the pattern required with a special ink on a metallized film applied to an insulating base of Bakelite, and then removing the unwanted metal by an etching process.

Since then progress has been made and the process, now known as the Technograph System, has reached a stage where the production of complete radio apparatus, sub-assemblies and components is a practical proposition.

The latest system includes a recovery process for the metal removed in the etching bath, as this would otherwise involve a considerable wastage of valuable material and of the chemicals used for etching.

Where simple circuit patterns not involving crossovers are required the patterns can be printed on a single metallized foil bonded to one surface of the insulating base, but where crossovers are inevitable a metal-insulator-metal sandwich must be used. In this case both surfaces of the insulating plate, or sheet, can be metallized and the circuit completed by punching holes and inserting rivets at the appropriate points.

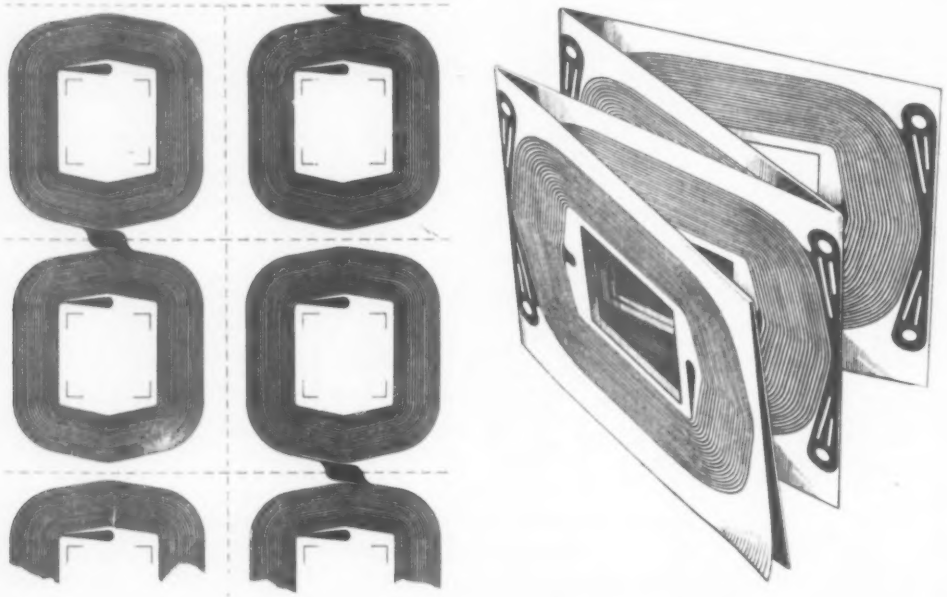
The Technograph system enables circuit patterns to be printed on foil bonded to flexible insulants which can be produced in the form of a long strip or roll some hundreds of feet long, which may be cut and folded to build up the particular unit required.

One application of this kind, unusual though it may seem, is the production of mains transformers. A section of a printed strip before and after partial folding is shown in the accompanying illustration. In the latter the centres of the "plates" have been punched out to form the core tunnel

It is easy by this method of construction to grade the thickness of the "wire" to give thicker conductors on the inside and thinner on the outside, where heat radiation is greatest, to achieve a more even temperature gradient throughout the winding than is possible with normal wire winding methods.

This process is now being extended to armature windings on electric motors.

The company handling the system is Technograph Printed Circuits Ltd., 32, Shaftesbury Avenue, London, W.1, who have just issued a booklet describing the system.



Details of Mains Transformer "winding" produced by the Technograph process.

Cushion that Switch-on Surge in AC/DC receivers

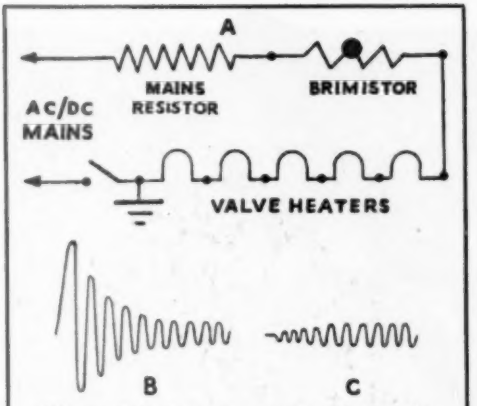


Diagram "A" shows the correct positioning of a Brimistor in the average circuit.

Diagram "B" shows an oscillogram of the normal "switch-on" surge which damages valves and dial lights.

Diagram "C": this oscillogram shows the gentle rise of BRIMISTOR controlled current and complete surge suppression.

OTHER USES

1. Wired in series with the lead to the reservoir condenser, Brimistors can be used to reduce the voltage surge associated with directly heated rectifiers.
2. Connected in series with a choke or focus coil, the negative temperature co-efficient of a Brimistor may be used to compensate for the positive temperature co-efficient of the coil.

CURRENT SURGE
BRIMISTOR
RESISTORS

Wired in series with valve heaters . . . dia lights . . . BRIMISTORS hold the starting current at a low value, permitting it gradually to rise until working temperature is reached, thus ensuring maximum life for both valves and lamps.

When cold the resistance of a BRIMISTOR is high. As it warms up with the passage of current, however, this resistance falls *gradually* to a very low level which usually can be ignored. At the very most a small reduction in the line cord or other voltage dropping resistance will provide the necessary compensation.

CHARACTERISTICS OF BRIMISTORS

Type	Cold resistance at 20° C.	Resistance with the following currents flowing				Max. Current	Price List
		0.1 amp.	0.15 amp.	0.2 amp.	0.3 amp.		
	ohms	ohms	ohms	ohms	ohms	amp.	
CZ1	3,000	180	100	75	44	0.3	*3/6d
CZ2	5,500	170	90	66	38	0.3	*3/6d
CZ3	1,500	100	50	35	—	0.2	*1/6d
C4	760	—	—	—	—	1.25	*5/-d
CZ6	3,000	200	120	80	45	0.45	*3/6d

* Brimistors are not subject to Purchase Tax.

Use CZ1 for 0.3 amp. and 0.1 amp. valves.

Use CZ2 for 0.15 amp. and 0.2 amp. valves.

Wire type CZ3 across the dial lamp (in conjunction with a CZ1 or CZ2 as above).

Notes on the use of BRIMISTORS

1. Owing to the high operating temperature (up to 250° C.) Brimistors must be spaced away from coils and waxed components.
2. They should be inserted in the "live" end of the heater chain—i.e. between mains resistance and rectifier valve heater.
3. At least ¼in. of wire must be left at each end before soldering to a tag.

BRIMISTORS are used in all popular AC/DC Television Receivers—ADD SOME TO YOUR STOCK

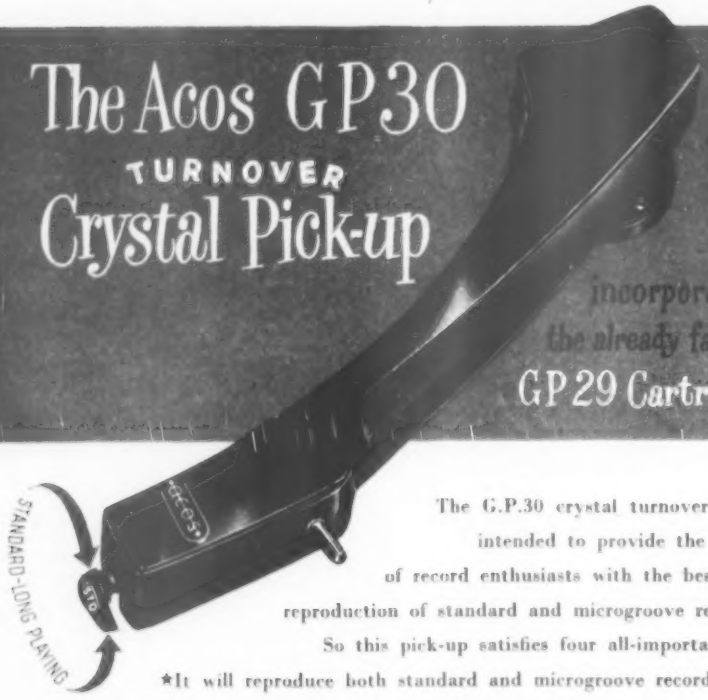
Standard Telephones and Cables Limited FOOTSCRAY, SIDCUP, KENT.

makers of BRIMAR VALVES *and* BRIMAR TELETUBES

Here it is...

The Acos GP30 TURNOVER Crystal Pick-up

incorporating the already famous GP 29 Cartridge



The G.P.30 crystal turnover pick-up is intended to provide the largest number of record enthusiasts with the best possible reproduction of standard and microgroove records.

So this pick-up satisfies four all-important requirements: ★It will reproduce both standard and microgroove records. It is simple to operate; a turn of the front knob brings either stylus into use. ★The output characteristics give balanced, distortion-free reproduction with minimum surface noise when used in conjunction with commercial equipment such as the normal radio set. ★It is extremely kind to the record—giving long record life. The careful design gives exceptional tracking capabilities at the low stylus pressure of ten grammes.

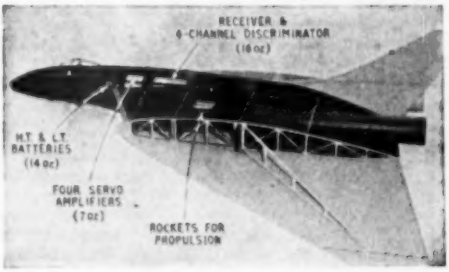
Price in Great Britain **£2.10.0** *plus P.T.* 21/5*d.*

always well ahead

COSMOCORD LIMITED · ENFIELD · MIDDLESEX

Radio-Controlled Jet Plane

Proportional Control on Four Channels



Demonstration model of aircraft with fuselage cut away to show disposition of radio equipment.

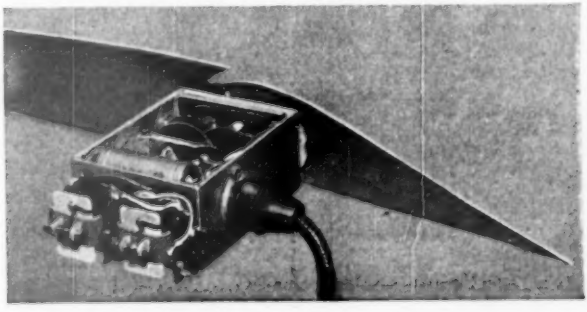
JET propulsion has been used in model aircraft for a good many years now, but jet propulsion plus radio control is something of a novelty. An example of this exciting combination was to be seen recently at the "Model Engineer" Exhibition in London, in the shape of a radio-controlled, rocket-propelled delta-wing aircraft. It was shown by the Low Speed Aerodynamics Research Association, who will eventually be using it for research into the aerodynamics of full-scale delta-wing aircraft. The model on view was actually a mock-up, with the fuselage cut away to show the positions of the rockets and radio equipment, but the real thing, now in the process of construction, is identical. It has a wing span of 64in and weighs about 10lb. Motive power is provided by two ducted rockets which will last for a matter of 30–40 seconds and give the model a probable speed of over 100 m.p.h.

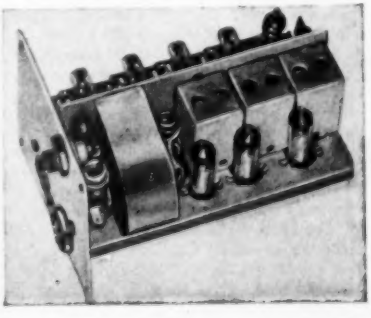
The control surfaces for manœuvring the aircraft in flight are actuated by servo-mechanisms controlled by a four-channel radio system—this was designed by the L.S.A.R.A. radio man, D. W. Allen. The principle of the system is to transmit four trains of square pulses and use them for controlling the servo-mechanisms by varying their respective mark/space ratios. In the aircraft the received pulse trains are smoothed out by storage capacitors to give four voltages which vary in proportion to the mark/space ratios. Each voltage varies above and below a certain reference value and so drives its associated servo-mechanism and control surface either one way or the other about a neutral position.

The four pulse trains, which have repetition frequencies of about 30 p.p.s., are transmitted by sub-carrier frequencies of 6.2 kc/s, 8.5 kc/s, 14 kc/s and 20 kc/s, which modulate a carrier frequency of about 27 Mc/s. (Actually the sub-carriers are not modulated by square-pulse waveforms in the conventional way. Each sub-carrier oscillator is biased off and triggered by a 30-c/s sawtooth waveform to give bursts of oscillation at the 30-p.p.s. repetition frequency. The operator varies the bias voltage so that the oscillator is triggered at different levels on the sawtooth. In this way he varies the duration of the bursts of oscillation, and hence the mark/space ratio of the resultant pulse train.) In the aircraft the 27-Mc/s signal is picked up by a superhet receiver. The four pulsed sub-carrier frequencies are then selected by tuned circuits and demodulated to give the original four pulse trains.

As can be seen from the illustration, the superhet receiver is a noteworthy example of miniaturization. In addition to the receiver proper (r.f. stage, oscillator, mixer, two i.f. stages, two power amplifiers), it contains the four tuned circuits and four associated detector-limiter valves. All the valves are hearing-aid types and they consume altogether less than one watt of l.t. power and one watt of h.t. power.

Left: One of the servo-mechanisms coupled to a demonstration section of a control surface; its positioning accuracy is 0.1 to 0.5 per cent. Right: The miniature receiver unit showing the 4-channel discriminator on the far side of the screen.





Metal Cone Loudspeaker

By F. H. BRITTAIN*

Part 2—Further Constructional Details: Alternative Methods of Mounting

The advantage of the metal cone in reducing harmonic and intermodulation distortion, and the expedients adopted to overcome its disadvantages from the point of view of frequency response were discussed in the article in the previous issue. The author now gives details of other aspects of the G.E.C. high-quality loudspeaker design and suggests types of mounting having a performance compatible with that of which the unit is capable.

RIGIDITY of the cone diaphragm is of paramount importance if harmonic and intermodulation distortion are to be kept to the minimum, and the proportions as well as the material of which the cone is constructed must be taken into account.

Cone Diameter.—The cone diameter has a direct bearing not only on its rigidity but also on its efficiency as a radiator of low frequencies. It is difficult to make a large cone which is both rigid and light in weight. On the other hand a small cone must be allowed a greater excursion if it is to radiate as much power at low frequencies as a larger one, and this increases the problems of designing a suitable surround, centring device, speech coil and magnet assembly. It was found possible to make a rigid cone of six inches diameter, and that size has been standardized, at least for the present.

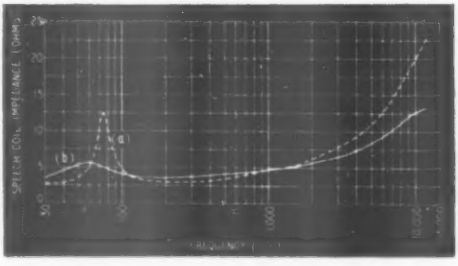
Speech Coil.—It was found that a speech coil of one inch diameter was just large enough to dissipate all the heat evolved in driving the cone to its maximum permitted excursion at the lowest frequency. The length of the speech coil was determined by the method discussed in the previous article under the heading "Driving-force Distortion." In order to achieve rigidity, the former on which the speech coil is wound is turned from solid Duralumin, and is welded to the cone. It is unlikely to distort, even if seriously overheated, and it is virtually impossible to bend or buckle it, no matter how severe the overload on the loudspeaker may be. The solid metal coil former also greatly reduces the change of impedance associated with the low-frequency resonance and the rise normally met with at the higher frequencies.

Suspension System.—This comprises a corrugated centring device, of conventional design, mounted between the cone and the magnet top plate, and a plastic material between the periphery of the cone and the loudspeaker bowl, which permits a peak displacement of 2 mm from the rest position. The particular plastic used was chosen for its low mechanical loss when subjected to vibration. It must retain its characteristics over very long periods of time, and be unaffected by heat and moisture.

Power-handling Capacity.—There are a number of ways in which the power-handling capacity of a loudspeaker may be limited. Maximum permitted excursion of the cone, excessive distortion of the sound, damage to the assembly, overheating of the speech coil, etc. In the case of the metal cone loudspeaker, the cone is extremely strong, and there is virtually no deterioration in the quality of reproduction, even when the loudspeaker is handling its maximum peak electrical power of 10 watts. The continuous rating is, of course, much lower than this extreme peak value, which must never be exceeded. During trials, it was necessary to run one single unit at a power of 30 watts for several hours on normal B.B.C. programmes in order to damage the loudspeaker. The limit is set by the danger of burning out the speech coil, which can easily occur, because the loudspeaker itself gives very little warning, in the form of audible distortion, that it is being grossly overrun. There is also the possibility of excessive travel of the speech coil if the loudspeaker is operated with a small or inadequate box or baffle. When this happens, audible warning is given by the speech coil former striking the safety stops. This will also happen, even with a large baffle, if the amplifier is slightly overloaded. The first indication of this may well be a slight displacement of the cone, which is quite easily visible and indicates asymmetry in the output waveform.

Mountings.—Some form of baffle is necessary, as with all types of cone loudspeaker, to prevent circula-

* Research Laboratories of the General Electric Company



Variation of speech-coil impedance with frequency: (a) with paper coil former; (b) with metal coil former.

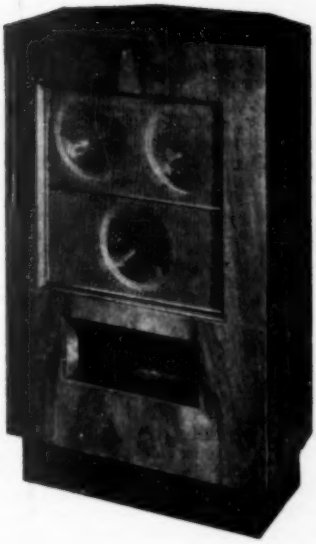
tion of acoustic energy directly between back and front of the diaphragm. The plane baffle is simple in principle, but inconvenient in practice, since it must be at least 10ft square for frequencies down to 50 c/s. A hole in the wall is excellent, but not often practicable. If this method is adopted care must be taken to treat the space at the rear of the diaphragm with sound-absorbing material to suppress reflections and resonances which might react on the cone. It is generally more convenient to construct the baffle in the form of a cabinet.

Closed Box.—In this simple case, the back of the diaphragm is completely enclosed, the front of the cone acting as a single-source radiator. The disadvantage is that the size of the enclosure must be relatively large, since the air enclosed behind the loudspeaker adds considerable stiffness to the cone suspension, raising the low-frequency resonance of the cone. With this form of cabinet, a constructional difficulty arises from the high sound pressures which are set up against the walls of the box, which has to be very strongly constructed to prevent the sides from vibrating and radiating sound which is "coloured" by their resonant frequencies. Reflections from the interior of the box must be prevented by placing sound-absorbing material inside it.

Bass Reflex or Vented Cabinet.—This form of cabinet is often used with those more ambitious reproducers which attempt to radiate frequencies as low as 40 or 50 c/s. It consists essentially of a Helmholtz resonator, the loudspeaker being mounted in one of its walls. The resonator is tuned to the main low-frequency resonance of the cone, to which it is tightly coupled by virtue of the fact that one part of the resonator wall is the cone of the loudspeaker. This tight coupling produces the appearance of a double-peaked resonance curve, both peaks of which are smaller than the single peak of the closed box. The interior of the resonator must be treated with damping material[1] to suppress secondary resonances and reflections. The walls of the resonator, like those of the closed box, are subject to high sound pressures, and must be carefully constructed to prevent vibration, and consequent re-radiation of sound.

Details of how to design a vented cabinet have already appeared in *Wireless World*.[2] The method of adjusting the magnitude of the upper resonance peak is carried out to a first approximation by the following simple test. The loudspeaker, including its transformer, is excited at its modified low-frequency resonance, by means of a suitable transient. In one case the transient is supplied from a source having a very low internal impedance, and in the other case, from a source whose impedance is similar to that of the amplifier which is to be used with the loudspeaker and the reflex cabinet. The low-impedance source will be found to produce a more damped response than that obtained from the higher-impedance source, damping material should be added to the bass reflex cabinet until a similar damped response is obtained under both conditions.

A convenient practical method of carrying out the test is to place a suitable resistance simulating the amplifier impedance across the loudspeaker transformer primary and then to apply and remove one or two dry cells across the primary. When the cells are applied, they are a low impedance themselves and shunt the resistance. When they are removed, the amplifier simulating resistance alone remains. The ear is an excellent judge of the "tick" or "boom" which is produced by this test. It is necessary to produce a "tick" or almost a "tick" in both cases. There should be practically no "boom" at all.



Right: Three metal-cone units mounted in a vented cabinet. This assembly is rated for 15 watts maximum continuous input.

Below: Experimental acoustic labyrinth constructed with inexpensive materials.

Acoustic Labyrinth.—This consists of a pipe or duct with sound-absorbing walls; it is virtually a silencer for the sound generated by the back of the loudspeaker. The dimensions of the labyrinth should be so chosen that its length is comparable to half the wavelength of the main resonance of the loudspeaker, but, in practice, a shorter length will be found to be quite efficacious. If the low-frequency absorption is adequate it is quite immaterial whether the end of the labyrinth is open or closed. The cross-sectional area of

[1] See, for example, "Loudspeaker Cabinet Design," by D. E. L. Shorter, *Wireless World*, Nov. and Dec., 1950.

[2] "Vented Loudspeaker Cabinets," by C. T. Chapman, Oct., 1949.

the duct is usually made similar to that of the cone. If care is taken in the design to prevent sound leaking through the walls of the labyrinth, it may be constructed from very cheap materials, such as woodwool, wire-netting and cardboard. The sound absorbing nature of the walls eliminates standing waves and reflections. In effect, an acoustic resistance is tightly coupled to the loudspeaker cone, damping it and absorbing acoustic power, making the labyrinth somewhat less efficient than either the closed box or the bass reflex cabinet. This resistance also helps to present a constant impedance to the cone and reduces the violent impedance changes encountered when the loudspeaker is operated in a living room. Its chief disadvantages are that it is rather bulky, and that apparatus such as output transformers or filters cannot be installed inside it.

By reducing the efficiency of the damping material it is feasible to construct a duct having characteristics intermediate between those of a labyrinth proper and a tuned pipe.

High-frequency Reproduction.—So far, special devices have been considered in connection with low-frequency reproduction, but a cone loudspeaker usually radiates high frequencies in a beam of narrower angle than low frequencies. It is sometimes necessary to design the cabinet to spread this high-frequency beam. This may be done either by refraction or reflection, bearing in mind that sound waves can only be refracted or reflected by objects comparable with their own wavelength. However, since it is the high frequencies that have to be spread, the wavelength is small and the size of the device need not be excessive. A more serious difficulty arises from multiple reflections which may occur between different parts of the refractor or reflector and the cone itself. For instance, the loudspeaker cone may be placed behind a narrow slot which will refract the sound and give excellent dispersion. This method is unsuitable for use with the highly reflecting metal cone, and the reaction on the cone motion produces "muddled" reproduction compared with that obtainable with free forward radiation. It has been found that the only satisfactory method is to use a reflector in such a way that none of the sound is ever reflected back on to the cone.

It is customary for æsthetic reasons to disguise the loudspeaker cone by placing it behind a gauze or grille. It is important that this gauze or grille should neither reflect sound back on to the cone, nor absorb it. It is difficult to find satisfactory materials which are opaque to light and yet transparent to sound. Woven glass fabric has been found to be satisfactory in some applications, but for the critical listener using the metal cone loudspeaker, all materials so far used have produced an audible impairment in quality; even the ordinary black muslin dust bag. The most satisfactory material is a very open wire mesh, but this material is not capable of completely hiding the loudspeaker.

RADIO RELAY REPORTING

A SOMEWHAT unusual problem in radio communication arose when the *Birmingham Mail* and the *Liverpool Daily Post* came to make arrangements for transmitting to their offices photographs of the recent opening by the Queen of the new dam for the Birmingham Corporation's water supply system at Claerwen, in the Welsh hills.

The distance to the nearest point on the telephone system was not great (some 18 miles), but the site of the dam, in a deep valley, made it impossible to find a workable line-of-site path, and recourse had to be made to a radio relay.

For this purpose, mobile v.h.f. relaying equipment was taken to the top of Craig Fawr, a 1,500ft rugged peak some 2½ miles from the dam. From here the picture signals were relayed to another v.h.f. mobile station located on the Llandrindod golf course, whence they were sent by local telephone line to the G.P.O. centre in the town 2½ miles away.

Marconi Type H16A radio telephone equipment installed in a vehicle with a Muirhead picture transmitter, and adjacent to another vehicle containing a mobile dark room, was used at the dam site while on Craif Fawr and the golf course, Marconi H16 mobile transmitter-receivers were used.

The equipments are all similar in frequency range and power. They are crystal controlled and operate on a single frequency in the band 78 to 100 Mc/s giving about 10 watts r.f. output to the aerial.

Equipment used at the Claerwen dam comprised a Muirhead picture transmitter and Marconi v.h.f. radio equipment type H16A.

LETTERS TO THE EDITOR

The Editor does not necessarily endorse the opinions expressed by his correspondents

"*Too Many Recording Characteristics?*"

I AGREE with Ruth Jackson (your August issue) that the fewer different standard characteristics in use the better, and I would like also to stress the importance of standard characteristics being so designed that correct reproducing apparatus can be constructed cheaply, and without the need for chokes. The reproducer designer finds it difficult to deal with the shape of some of the characteristic curves presented to him. This requirement may add a little complication at the recording end, but cost there is relatively unimportant.

Welwyn, Herts. J. M. LITTLE.

Exiled Radio Engineers

I RETURNED home to England during the summer, and tried hard to find a job. But, as I had half expected, there seem to be no jobs in England which I can afford to take. This is a very serious matter, not so much from my personal viewpoint, but in the wider national interest. In every capital in Europe, in every industrial city of America you will find a few British engineers like me: we are, I suppose, moderately good designers or administrators, because we keep our jobs in spite of the language problem and the competition of the natives; we must be moderately energetic to have uprooted ourselves from the relative security of England and the social teas of Savoy Place. Some of us are prepared to stay forever in our new country; some, like myself, would like to return to England with our broadened experience. But we cannot afford it.

I am quite aware of the problems of the national economy: the newspapers and the serious weeklies will not let me overlook the problems of the export market, as viewed from editorial chairs. It is when I apply the available data to my own problem that I become uneasy. The *London and Cambridge Economic Service Bulletin* (New Series, No. 3) states that a weekly wage-earner received 175% of his 1938 pay in 1947, and 219% in June, 1952. The retail price index, of course, has risen more than this, but that is quite a separate issue.

The professional engineer usually gets an annual increment of about 5% of his salary: this represents the increasing value of his services. A young engineer who was earning the same as a skilled tradesman in 1938 should therefore now be earning twice as much, and thus should now have four times the money income which he had in 1938. This is, indeed, just about what I am receiving for my work in another country. My contemporaries in England must be satisfied with a gross income 30% lower, and a standard of living which is even more depressed.

You may think, Sir, that I have found some happy Schachtian economy, cut off from the economic storms. This is not so: the equipment I design is mainly for export, and is sold in embarrassing quantities in direct competition with British exports. Low salaries are not the way to produce exportable engineering products: I suspect that too many engineers in England are spending too much time on the problem of making both ends meet, instead of on engineering. There is always a shortage of engineers, and the fatuous suggestion of a speaker at an I.E.E. discussion that the engineering committees of the engineering industry can cure this shows a complete lack of any sense of reality. Engineering as a profession is priced out of the market, and in the words of *The Economist*, this will go on "so long as enough suckers are available to accept fixed returns in funny money."

There are two problems here. The first a personal one: should I return to England to pay increased taxes on a greatly reduced income? The taxes I accept, because they represent the process of solving the national problem, but the income reduction is too great. The second problem is a national one. Somewhere in the line from design to sales there is something wrong: too expensive products come from underpaid designers. Management is failing to carry out its essential function, which is to manage, and is allowing things to drift in accordance with Mary Follett's "logic of the situation." To cheapen the product, reduce wages: to increase output, increase hours. Like most policies of "logical drift," this is a bankrupt policy and a policy of bankruptcy. It leads to a flourishing export business in engineers and skilled tradesmen, and when they leave, the Bank of England cannot enter the capital of their skill on form CD3; the Board of Trade shows no hard currency return in the balance of trade.

JOHN DOE.

Helping the Army

I WAS pleased to see Wm. A. Richardson's letter in the October issue. I think it will be of interest to your readers that Royal Signals now have a special job for the radio amateur and others with technical or operating ability. I have the honour to command the Army Wireless Reserve Squadron, SR, now in course of formation.* The only training liability is 15 days' annual camp. We have an important part to play in National Defence, and I sincerely invite those interested to write to me, without obligation, for further details.

DENNIS W. J. HAYLOCK, Maj. (G3ADZ).
230, Devonshire Avenue,
Southsea, Hants.

* Details of the constitution of the Army Emergency Reserve, of which the Wireless Reserve is a part, are given on page 503.—ED.

V.H.F. as an "Extra"?

I HAVE been following with interest the discussion on the desirability and/or necessity of v.h.f. broadcasting in this country. I would like to point out that the number of people interested in the reception of very high fidelity broadcasts are only a small minority of the total listening public. This statement is, in my opinion, amply upheld by the fact that the normal production-type receiver is usually incapable of doing full justice even to the normal B.B.C. transmissions.

If the listening public were to desire better quality, surely manufacturers would be forced to provide them with their needs and produce sets with push-pull, infinite impedance detection, reasonable baffle area, etc.

However, since we live in a democracy and the minority have a right to satisfaction, I suggest that by all means v.h.f. should be developed, but a surcharge should be applied to those licences which cover sets tuning to these frequencies. This would then cover the cost of maintaining and operating the special equipment, and thus spare the public in general having to bear the cost, either directly or indirectly, of the services for the minority.

Manchester, 4. PETER DEAN.

I.F. Inquiry

AS a result of difficulties arising from the Copenhagen Plan, a questionnaire was sent out by the European Broadcasting Union to associations representing receiver manufacturers in nine different countries, to ascertain their views on the choice of an i.f. for broadcast receivers.

The results of this investigation have now been published by the E.B.U. in the form of a document (No. CT45-E) the introduction to which refers to my article

on this subject published in your September, 1949, issue. In general, the document appears to agree substantially with the findings of that article.

The E.B.U. is now about to institute an analogous inquiry concerning television receivers, to which I have been requested to contribute.

London, N.W.5. G. H. RUSSELL.

BOOKS RECEIVED

Electronic Measurements by F. E. Terman, Sc.D and J. M. Pettit, Ph.D. An extensively revised second edition of Prof. Terman's "Measurements in Radio Engineering" which now covers pulse techniques, microwaves, television and radar in addition to conventional radio communication. Pp. 707+xiii; Figs. 448. McGraw-Hill Publishing Co. Ltd., 95, Farringdon Street, London, E.C.4. Price 72s 6d.

Principles of Radio by Keith Henney and Glen A. Richardson. Completely revised 6th edition including chapters on television, f.m., radar, wave-shaping circuits and test equipment. Pp. 655; Figs. 407. Chapman and Hall, 37, Essex Street, London, W.C.2. Price 44s.

The Use of Radar at Sea. Edited by Capt. F. J. Wylie, R.N. (ret.), for the Institute of Navigation. Foreword by Sir Robert Watson-Watt. An exposition of the principles and potentialities of marine radar, with practical guidance on the interpretation of displays. Pp. 279+xv; Figs. 170. Hollis and Carter, 25, Ashley Place, London, S.W.1. Price 30s.

The Resonant Cavity Magnetron by R. S. H. Boulding, B.Sc., M.I.E.E., F.Inst.P. Principles underlying its operation; performance charts; descriptions of practical magnetrons and their associated circuits. Pp. 147+vii; Figs. 80. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 21s.

Radio Research 1951. Report of the Radio Research Board together with the report of the Director of Radio Research, Department of Scientific and Industrial Research. Pp. 36+iv; Figs. 7. H.M. Stationery Office, York House, Kingsway, London, W.C.2. Price 1s 6d.

Vacuum Technique by A. L. Reimann, Ph.D., D.Sc. Survey of methods of producing high vacua by pumps and "getters," glass manipulation and seals, and pressure measurement. Pp. 449+ix; Figs. 184. Chapman and Hall, 37, Essex Street, London, W.C.2. Price 50s.

Physics as a Career by Norman Clarke, B.Sc., F.Inst.P. A guide to the posts open to physicists in industry, Government service, hospitals, etc. and to the avenues of training leading to the recognized qualifications. Published by the Institute of Physics, 47, Belgrave Square, London, S.W.1. Price 6s.

Textbook on Sound by J. W. Winstanley, M.Sc., A.Inst.P. Basic classical acoustics in concise form with some reference to their practical applications. Primarily intended for use in schools. Pp. 239+xi; Figs. 153. Longmans, Green & Co. Ltd., 6 and 7, Clifford Street, London, W.1. Price 12s 6d.

Applied Electronics Annual 1952. Edited by R. E. Blaise, A. M. Brit., I.R.E. International year book and directory (including classified buyer's guide) for radio and electronic equipment. Pp. 240 (illustrated). British-Continental Trade Press, Ltd., 222, Strand, London, W.C.2. Price £2.

Wireless Fundamentals by E. Armitage, M.A., B.Sc. Assumes an elementary knowledge of electricity and adopts the physical and experimental approach to the subject. Pp. 368+x; Figs 334. Sir Isaac Pitman & Sons Ltd., Parker Street, Kingsway, London, W.C.2. Price 18s.

Examples in Electrical Calculations 1952 (BR158/52). Written primarily for the guidance of Naval students of electrical technology, this textbook covers also the requirements of students preparing for Preliminary and Intermediate Grade examinations of City and Guilds or the Ordinary National Certificate in electrical engineering. Pp. 507; Figs. 263. H.M. Stationery Office, York House, Kingsway, London, W.C.2. Price 17s 6d.

Elements of Radio Engineering by H. I. F. Peel, M.Sc. Tech., A.M.I.E.E. Textbook designed to cover requirements of Radio and Telecommunications (Principles) 1 and 2 of City and Guilds' five-year course. Pp. 232; Figs. 153. Cleaver-Hume Press Ltd., 42A South Audley Street, London, W.1. Price 10s 6d.

Reports on Progress in Physics Vol. XV 1952. Edited by A. C. Stickland. Includes papers on "Ferrites" by A. Fairweather, F. F. Roberts and A. J. E. Welch and "Travelling Wave Tubes" by R. Kompfner. Pp. 338; Figs. 134. The Physical Society, 1 Lowther Gardens, Prince Consort Road, London, S.W.7. Price (to non-Fellows), £2 11s 6d by post.

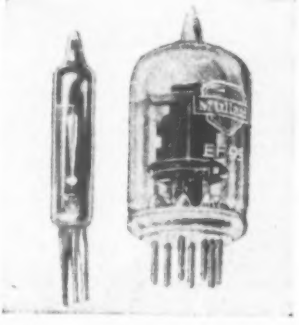
New Miniature Valves

An R.F. pentode with characteristics similar to those of the well-known American 6AK5 has been added to the Mullard range of miniatures. Known as the EF95 the new pentode is of all-glass construction with a B7G base. Its low noise qualities and low input and output capacitances render it particularly suitable for use in v.h.f. equipments. Other features of interest are: low heater consumption, e.g., 175 mA at 6.3 V, optimum performance obtainable with only 180 V h.t. and quite good results with 120 V.

Another new Mullard valve is a novel tuning indicator said to be the first of its kind that can be used in all-dry battery receivers as well as in mains sets.

Of sub-miniature construction, it has no base and is intended to be wired into the set. The DM70, as it is known, is a triode and has a plate-type control grid with an aperture shaped like an exclamation mark and through which the anode is viewed. The anode is coated with fluorescent material and the illumination produced is controlled by the negative potential on the control grid.

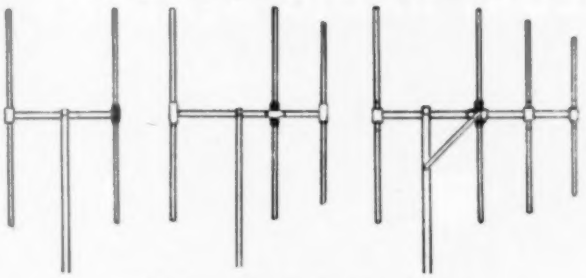
The indicator operates normally at 90 V h.t. and consumes 0.24 mA, but it will also function at 60 V if necessary. With 90 V h.t. the grid extinction voltage is −11 and with 60 V it is −9.5 V. The filament is directly heated and requires 1.4 V at 25 mA.



Two new Mullard valves, the EF95 (6AK5 equivalent) and sub-miniature tuning indicator, DM70.

THE "BELLING-LEE" PAGE

Providing technical information, service and advice in relation to our products and the suppression of electrical interference



HAPPY WITH AN "H"

The very first factory-made aerial for British television was an "H" designed by "Belling-Lee." The original design has been modified as and when necessary, to enable it to keep its place as the recognised standard by which all others are judged.

When better aerials were required to provide a better signal under fringe area conditions, many variations were tried, but the resultant super aerial turned out to be a modified "H," a "Multirod" with two directors. When the spending power of the public became lower, and we reached the state when every shilling mattered, the price of some television receivers fell a little. We were all prepared to sacrifice a little, so our research teams and designers kept on with their investigations into the most economical shapes, materials and dimensions. The result was that the "H" remained, but materials and dimensions were altered (1) to produce the Junior "H," and (2) to produce the Junior "Multirod." The Junior "H" is very well known, it is a superlative aerial in every respect. The Junior "Multirod," our latest 3-element fringe array designed particularly for use in country locations, gives a result somewhere between that of the Senior "H" and the "Multirod," and shows a saving of nearly five pounds against the price of the standard "Multirod."

All "Belling-Lee" aerials are designed first by electronic engineers who specify lengths and spacings, insulators, etc. This data is then passed to mechanical engineers, who specify the grade and gauge of material, after taking into account all stresses, strains and turning movements that are likely to be encountered from the winds that blow around our coast and in high, exposed places.

If we could find another shape of aerial which would provide equally good electrical and mechanical results under all conditions we would not hesitate to change, but so far we feel that it is fortunate that the best we can achieve is an aerial with perpendicular elements and a horizontal cross-arm. Lines in these directions seem to fit easily into our lives, our walls are perpendicular and the ridges of our homes are horizontal. The "H" is easy to look at, and we believe most people are happy with it. Whilst we are always looking for something better, we hope its shape will be as comely and as symmetrical as the "H" type aerial we have been manufacturing now for over fifteen years.

Head Amplifiers

FIG. 2

Here is our best Radio Show funny story. One of our engineers spent a long time trying to answer satisfactorily a lot of apparently meaningless questions about head amplifiers. He really did exercise a great deal of patience. Eventually it transpired that the questioner was interested in head-phones!

FIG. 1

The television head amplifier we were discussing is that illustrated in Fig. 1, and which is intended to be secured to the cross-arm of either a "Multirod" or Junior "Multirod" (3-element array). The amplifier is connected to the power unit, Fig. 2, by co-axial feeder, which also carries the requisite mains at 30 volts. The power unit is intended to be fixed somewhere close to the receiver, it has four connections, one to the aerial amplifier, one to the receiver, and one to mains. The terminal should be connected to a good independent electrical earth, i.e.; it must not be connected to the television receiver chassis. At present this amplifier is not available for use with television receivers using balanced feeder, but a model will be available shortly for this purpose.

Christmas

We wish all our readers a Merry Christmas. To those in the Kirk o' Shotts and Wenvoe areas, who will be experiencing their first television Xmas, may they enjoy every minute of this addition to their usual festivities.

Will those in coastal towns, fishing ports, yachting centres etc., bear in mind that "Belling-Lee" are specialising in suppression on board ship.
We have done such work on ships of all sizes from the "Queen" class to trawlers, drifters and yachts.

Written 25th Oct. 1952

BELLING & LEE LTD
CAMBRIDGE ARTERIAL RD. ENFIELD, MIDDX. ENGLAND

40 MARCONI RADIO BEACONS

will ring the British Isles

From the Channel Islands to the Shetlands, from the Thames to the West Coast of Ireland . . . 40 lighthouses and lightships around the coasts of Great Britain and Ireland are to be equipped with Marconi Marine Beacons by the Lighthouse Authorities. These M.F. Beacons will be fully duplicated with changeover switching, indicating and alarm facilities; in addition specially selected stations in the vicinity of the main ports will provide 'request' transmissions.

MARCONI marine beacons

MARCONI'S WIRELESS TELEGRAPH COMPANY LTD · CHELMSFORD · ESSEX

WORLD OF WIRELESS

Television Society Show • Extended Amateur Facilities • Business Radio • New Technological Award

Television Show

THE annual exhibition of the Television Society will be held on January 23rd and 24th at 155, Charing Cross Road, London, W.C.1, by invitation of the Edison Swan Electric Co. It will be open on the first day from 6.0 to 9.30 when admission will be restricted to members of the Society. On the second day it will be open from 10.30 a.m. to 9 p.m. when the holders of invitation tickets will be admitted. These tickets are available from members of the Society and G. T. Clack, the Lecture Secretary, 43, Mandeville House, Notre Dame Estate, Clapham, S.W.4.

It is anticipated that there will be about 40 exhibiting firms who have been invited by the Society to show equipment relating to television engineering or production, or to the production of television programmes. Individual members of the Society may also exhibit items which they have designed or constructed, or for which they have had a substantial degree of technical responsibility.

It is anticipated that the Society's 405-line vision transmitter will be operating at the show. A signal distribution system is being installed so that some of the equipment exhibited will be seen in use.

W/T Training for Scouts

SPECIAL transmitting licences for the training of Boy Scouts in wireless telegraphy are now being issued by the Postmaster General. The licences authorize the operation for training purposes of a 5-watt fixed transmitting and receiving station to work a given number of 1-watt portable stations operating within a radius of 10 miles.

The network of stations will operate on W/T only, on one frequency in the 144-146 Mc/s band and the portable stations will use the call sign of the fixed transmitter with the suffix "/1," "/2," etc.

Conditions of operation are in general those stipulated for amateur transmitters. Enquiries concerning this special licence should be addressed to the Engineer-in-Chief, Radio Branch, WM3/3, General Post Office, London, E.C.1.

Amateur 21-Mc/s Band

AS was expected when the announcement was made in June that amateurs could use the 21-21.2 Mc/s band for telegraphy, it has now been extended to 21.45 Mc/s. This brings British amateurs into line with their opposite numbers in North America.

In extending the band, the G.P.O. announced that permission has been granted provided no interference is caused with other services operating in the band. Amateurs are also reminded to guard against the emission of second harmonics in the television band.

V.H.F. Radio

IT is estimated by the R.I. Council that the police, fire and ambulance services in this country now operate nearly 4,000 v.h.f. radio-telephone stations (fixed and mobile) and that the number of stations operated by transport, water, sewage, gas, electricity and other public utility services probably exceeds 500, an increase of about 80 per cent in just over a year. In addition, there are a large number of stations licensed to taxi-cab operators.

So much for the land mobile use of v.h.f. radio. In the maritime world there is also a growing demand for v.h.f. radio-telephone equipment. Little more than a year ago only 25 ships using the Thames had been fitted by Rees Mace Marine with Pye v.h.f. equipment whereas to-day over 100 are equipped. Similar progress has been made with regard to vessels using other ports.

C.G.I.A.

THE City and Guilds of London Institute has introduced an award at a considerably higher level than that of its Full Technological Certificates. This Insignia Award in Technology (C.G.I.A.) will lay stress upon technical training based on practical experience and theoretical study as distinct from the more academic approach to training. It is intended "to be a mark of distinction for those who have combined with a sound, practical training an adequate knowledge of the fundamental scientific principles of their industry, and who possess a capacity for leadership and administration."

Copies of the regulations governing the award are available from the Director, Department of Technology (I.A.), 31, Brechin Place, London, S.W.7.

Radio Mechanics' Salaries

THE claim of radio mechanics employed in civil aviation for a new salary scale of £460 at the age of 25 rising by £20 annually to £570 at 31 has been rejected by the Ministry of Civil Aviation. A few days before this issue appears the dispute is to be heard by the Civil Service Arbitration Tribunal.

At present the salary scale is £370 at 25 with the same increments rising to £450 at 31.

PERSONALITIES

H.R.H. The Duke of Edinburgh, K.G., has extended his patronage to the Radio Society of Great Britain.

Captain F. J. Wylie, R.N. (Ret.), director of the Radio Advisory Service of the Chamber of Shipping and the Liverpool Steamship Owners' Association, has been elected chairman of the Executive Committee of the Institute of Navigation. Captain Wylie, whose nautical career (1909-1947) was closely associated with radio, was director of radio equipment at the Admiralty from 1944-1946. He was general editor of "The Use of Radar at Sea," recently published by the Institute of Navigation.

D. T. N. Williamson recently visited Toronto and gave a lecture at a joint meeting of the Acoustical Institute and the Toronto Branch of the American I.R.E., attended by about 500. For his demonstration he used an experimental pick-up, a Williamson amplifier and an Acoustical Corner Ribbon loudspeaker.

P. G. A. H. Voigt, who has been in Canada for the past two years and, until recently, has been part-time instructor in electronics at the Ryerson Institute of Technology, Toronto, is now with Engineered Sound Systems of Toronto.

J. R. D. Sainsbury has relinquished his appointment as export manager of Ultra Electric, Ltd., which he joined in 1946, to become general sales manager of Chassay Bros., radio manufacturers, of Bulawayo. Prior to joining Ultra he served from 1939 in the Royal Navy as a Signal Officer reaching the rank of Lieutenant Commander. He is well known in amateur circles as G8HV, and in the Royal Naval Volunteer Wireless Reserve.

J. L. Furner has been appointed sales manager of the Telecommunications Division of the Plessey Co. in succession to Air Commodore T. P. Fagan, who is now acting as liaison between the Company and foreign Governments and Government Departments. Mr. Furner was for 26 years with Mullard, during the last three of which he was a member of the Communications and Industrial Valve Division.

J. W. M. Swanson, who joined the staff of the B.B.C. in 1934 as an assistant maintenance engineer at the North Regional transmitting station at Moorside Edge, has been appointed engineer-in-charge, Newcastle. In 1943 he became assistant engineer-in-charge at the B.B.C.'s Monitoring Station at

Caversham and held this post until his present appointment.

L. Atherton, B.Sc., A.M.I.E.E., has joined Mullard's Equipment Division to take charge of the Special Products Commercial Group which specializes in ultrasonic equipment and laboratory and industrial applications of electronic techniques. He was previously at the Ministry of Supply Atomic Energy Factory. During the recent war he was seconded from the R.A.F. to T.R.E.

G. Darnley Smith, managing director of Bush Radio, Ltd., and Cinema-Television, Ltd., has been appointed a member of the Government's reconstituted Television Advisory Committee. He has been chairman of the Television Policy Committee of the Radio Industry Council since its formation in 1948 and is this year's chairman of the R.I.C.

(Copyright Douglas Glass)

G. DARNLEY SMITH

C. O. Stanley, C.B.E., who has also been appointed to the Television Advisory Committee, is chairman of Pye, Ltd., and is a director of the Associated Broadcasting Development Co., recently formed to promote sponsored television in this country, and High-Definition Films, Ltd., formed to develop the use of electronic apparatus in the film industry. He is one of the eight radio industry representatives on the Radio Rearmament Advisory Committee of the Ministry of Supply.

H. L. Bowen, a technical executive of the Valve Division of Mullard's, recently completed 25 years' service with the Company, and to mark the occasion was presented with an inscribed gold watch and a cheque. He joined the Company as an outside representative, and, after acting as assistant to T. E. Goldup for eight years, took charge of the Company's Technical Service Department. He has been closely associated with the work of the British Radio Valve Manufacturers' Association, and is now chairman of its Technical Committee. He is also a member of the Valve Standardization Committee of the International Electro-technical Commission.

Edgar Lipworth, M.Sc., of Salford, Lancs, is among the six recipients of RCA Fellowships awarded by the Radio Corporation of America to young scientists and graduate engineering students. He is in the Physics Department at Columbia University. He received his Bachelor of Science degree from Manchester University in 1947, and his M.Sc. from Columbia University in 1949. From 1942-1945 he was with the Air Ministry.

OBITUARY

J. J. Honan, who for many years contributed frequently to both *Wireless World* and *Wireless Engineer* died at Limerick, Eire, on October 27th, at the age of 69. He was an associate member of the I.E.E. and on his retirement from the Patent Office was an assistant examiner.

OUR AUTHORS

H. Stibbé, contributor of the article "Microphony in Superhet Oscillators" in this issue, is assistant head of the Government Contracts Section of the design and development laboratories of Bush Radio. He was previously in the radio laboratories of Mitcham Works, Ltd., and the Plessey Co. During the war he served as W.O.II Armament Artificer (Wireless) in R.E.M.E. He has served on the Brit. I.R.E. Education and Examination Committee since 1950 and is now examiner in radio reception (receiver design and practice) for the Institution's graduateship examination.

Dr. de Bruyne, who contributes the article on the use of a Fresnel lens for the magnification of television images (p. 502), was formerly fellow and lecturer of Trinity College, Cambridge, and worked at the Cavendish Laboratory under Lord Rutherford until 1934, when he started his own firm (Aero Research, Ltd., of Duxford) of which he is managing directoor.

C. O. STANLEY, C.B.E.
(See "Personalities")

IN BRIEF

Receiving Licences.—At the end of September there were 12,843,595 broadcast receiving licences current in the United Kingdom including 1,655,446 for television (an increase of 57,500 during the month) and 163,886 for car radio receivers.

Radio Show, 1953.—The dates of the 20th National Radio Exhibition have now been confirmed by the Radio Industry Council—September 1st to the 12th at Earls Court, London.

Other Exhibitions.—Announcements have been made by the organizers of the dates of the following 1953 exhibitions: British Industries Fair (Olympia and Earls Court, London and Castle Bromwich), April 27th-May 8th; British Plastics Exhibition and Convention (Olympia), June 3rd-13th; and the Ideal Home Exhibition (Olympia), March 3rd to 28th.

U.S. Television Stations.—According to figures published in the October issue of *Electronics*, the number of applications for permission to build television stations in the United States was at the end of August double that of a year ago—855 compared with 424. The number of stations operating is given as 109 and there are 34 transmitters under construction. During the same period medium-wave broadcasting stations increased from 2,292 to 2,356. There were 112 stations being built and outstanding applications for a further 291. F.M. stations decreased from 645 to 622 during the year, but there are 21 stations under construction and 12 outstanding applications for licences.

A Prototype of the Ekco Airfield Radar Approach Aid has been ordered by the U.S. Air Navigation Development Board for evaluation. It uses a small dish-shaped scanner producing a pencil-like beam and is manually controlled in the vertical plane but linked with a v.h.f. direction finder for azimuth scanning. Range and bearing are recorded and the controller can talk the aircraft down by v.h.f. radio-telephone. The equipment has been in use experimentally at the Southend Airport for some time.

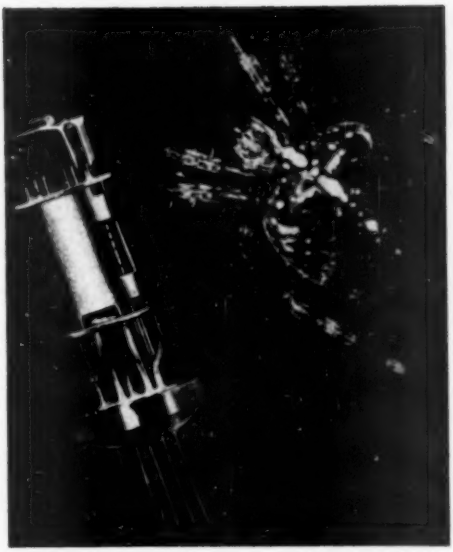
Guided Weapons.—The Research Laboratories of the G.E.C. are to set up a unit at the Long Range Weapons Establishment, S. Australia, for trials and further development of guided weapon equipment.

E.I.B.A.—The Electrical Industries Benevolent Association records in its report for 1951 that collections at the London Radio Industries Club luncheons contributed £238 to its funds. The B.B.C., the Radio Industry Council and a number of radio manufacturers are included in the list of donors. The object of the Association is to assist directly or indirectly any deserving and necessitous person (excluding manual workers) who are or have been engaged primarily in any branch of the electrical industry.

Institute of Navigation.—In the report of the Institute presented at the Annual meeting on October 17th, it is recorded that the membership at the end of June was 1,254—92 more than the previous year.

H. L. BOWEN
(See "Personalities")

"Navigation Today" is the title of an exhibition which is to be held at the Science Museum, South Kensington, from April 1st next year.



"Come into my parlour" *said the spider to the valve, mistaking it for a fly. We do not know whether spiders have bad eyesight or not, but at any rate this electrode structure of a sub-miniature hearing-aid valve is not very much bigger than a blue-bottle, and the spider (common garden type) can hardly be blamed for investigating it. The valve is a typical example of the products of a new experimental factory set up by Mullard at Whyteleafe, Surrey, specially for the mass-production of miniature, sub-miniature and "reliable" valves.*

Twenty-seven inch c.r.t. with metal shell and weighing 29 lb is being produced by the Radio Corporation of America for "de luxe home television receivers." The overall length of the new tube is slightly shorter than its 21-in predecessor.

R.A.E. Results.—Figures issued by the City & Guilds of London Institute for the Radio Amateurs' Examination held in May record that the number of entries was 70 fewer than in 1951. Of the 534 entrants 423 (79.3%) passed. The percentage of passes in 1950 and 1951 were 79.4 and 83.6 respectively. Examiners report that candidates work was again of a fairly high standard.

"The Old N'lons."—Lord Eustace Percy will be the guest of honour at the 25th annual dinner and reunion of The Old N'lons Association (Northampton Engineering College Past Students' Association) on November 28th at the Connaught Rooms, London, W.C.2.

Swiss Television.—It has been decided by the Swiss Federal Parliament that the Posts and Telegraphs Dept. should build a television station in Zurich which will be operated experimentally by the Swiss broadcasting authority (S.S.R.) for three years. It is planned to have the 625-line station operating next spring.

German Communication and Transport Exhibition, which will be held in the Munich Exhibition Park (Ausstellungspark) from June 20th to October 11th next year, will cover all sections of modern transport and communications.

German Visitors.—A group of eight heads and deputy heads of German technical colleges recently visited this country to study the training of technicians for industry. The tour, which was arranged by the British Council at the request of the Foreign Office, covered colleges and training establishments in London (including E.M.I. Institutes), Rugby (B.T.H.), Coventry, Birmingham, Manchester, Bolton, Edinburgh and Glasgow.

PUBLICATIONS

B.o.T. Directory.—The Board of Trade has issued a directory giving the functions, addresses and telephone numbers of the various sections of the Board. The directory, which was published as a supplement to the *B.o.T. Journal* and is now available from H.M.S.O., price 9d, also includes a detailed list of the industries for which each of the Ministries or Departments is primarily responsible so far as the allocation of materials is concerned.

Capacitor Paper.—"Measurement of the Thickness of Capacitor Paper" is the title of a 10-page Circular (No. 532) by Wilmer Souder and S. B. Newman, which is issued by the U.S. National Bureau of Standards. It is available from the Government Printing Office, Washington 25, D.C., price 20 cents, including postage.

FBI Register.—The twenty-fifth edition of the "F.B.I. Register of British Manufacturers," which includes a classified Buyers' Guide listing over 6,000 F.B.I. member firms under some 5,000 alphabetically listed products and services, is published by Kelly's Directories and Iliffe & Sons, price 42s. It also includes in its 922 pages alphabetical lists of member firms, trade associations, trade names and trade marks.

CABMA Register.—The Canadian Association of British Manufacturers and Agencies (CABMA), which was formed for the development of British trade with Canada, has arranged with our Publishers and Kelly's Directories to issue next June the first officially-sponsored directory of British manufacturers and exporters whose products and services are available in Canada. It will contain classified lists of names, addresses, proprietary names and trade marks, products and services of U.K. manufacturers and exporters trading with Canada.

"CQ-TV," the quarterly bulletin of the British Amateur Television Club, is now in its fourth year of publication. Devoted entirely to the interests of the amateur television transmitter, the October issue includes short articles on a flying-spot scanner video amplifier, simple master pulse generator and a 70cm modulator. Particulars of the Society are obtainable from M. Barlow, G3CVO, Cheyne Cottage, Dukeswood Drive, Gerrards Cross, Bucks.

Patents.—A brief guide to the collection of Patent Specifications in the City's Technical Library has been issued by the Manchester Public Libraries. The 8-page booklet summarizes the library's five million or more specifications and other patent publications. In addition to British specifications, the library houses U.S. specifications from 1893, Australian from 1904 and Irish from 1928, and also indexes to Canadian, New Zealand and South African specifications.

BUSINESS NOTES

Leevers-Rich Maintenance, Ltd., is the name of the company recently formed by Leevers-Rich & Co. for the servicing of its studio recording equipment, and the testing of all equipment manufactured by its associated company, Leevers-Rich Equipment, Ltd. It will be under the management of Bernard J. Brown. It is pointed out that the repair and testing facilities are available to private users.

Marconi Marine radio-communication equipment is to be fitted in each of the seven cargo ships being built at the Hindustan Shipyard, Vizagapatam, for the Scindia Steam Navigation Co.

Luxor Electronic SA (Pty.), Ltd., the recently formed Johannesburg branch of Luxor Radio A/B, Sweden, would like to hear from English manufacturers able to supply components for broadcast receivers. Communications should be addressed, in the first instance, to their correspondents Lawrence Wilkinson & Co., 2, Bythorn, Bronshill Road, Torquay.

Canadian Agency Enquiry.—Technical Materials Corporation of Canada, 160, Metcalfe Street, Ottawa, 4, want to obtain the agency of a United Kingdom manufacturer of radar, echo sounders and communications equipment for the Ottawa district of Canada. Communications should be sent direct to Ottawa marked for the attention of Douglas Carroll. In order that the Trade Commissioner at Ottawa can be informed and thus be in a position to offer any assistance that may be required, interested manufacturers are asked to notify the Board of Trade, C.R.E. Dept., Horse Guards Avenue, London, S.W.1, quoting ref. CRE/34679/52.

High Definition Films, Ltd., announce that A. M. Spooner has joined the staff for work associated with electronic process shots and artificial scenic devices. Until the end of July he was a member of the Designs Department of the B.B.C.

Dynatron Radio, Ltd., is celebrating its silver jubilee this year. It was formed jointly in 1927 by R. H. and A. G. Hacker (originally as H. Hacker & Sons) for the manufacture of the first radiogramophone using the name Dynatron.

Coming of Age.—Founded in 1931 by R. N. Wellington, the managing director, Sound Sales, Ltd., attained its majority on September 19th.

Marconi's have received an order for the supply of nine 20-kW high-frequency transmitters for installation

at Paradys near Bloemfontein. Although the Union of South Africa is not, except for a comparatively small area, in the tropics, it is permitted to use the frequencies allocated for tropical broadcasting (3,200-3,400, 4,750-4,995 and 5,005-5,060 kc/s).

NEW ADDRESSES

Film Industries, Ltd., manufacturers of sound reproducing equipment, have moved their offices and repair section from Paddington Street, London, W.1, to 90, Belsize Lane, London, N.W.3. (Tel.: Hampstead 9632/3.)

Telecraft, Ltd., manufacturers of television aerials and accessories, have opened an aerial sales and erection depot at Canford Chambers, St. Peter's Road, Bournemouth. (Tel. Bournemouth 2282.)

Homelab Instruments, manufacturers of signal generators and test equipment, of 68a, Cobden Road, London, E.11, have moved to 615-617, High Road, Leyton, London, E.10 (Tel.: Leytonstone 5651).

Electrical Remote Control Co., manufacturers of automatic electrical control apparatus, have moved to Elremco Works, East Industrial Estate, Harlow New Town, Essex (Tel.: Harlow 3032).

MEETINGS

Institution of Electrical Engineers

Radio Section.—"A Survey of Present Knowledge of Thermionic Emitters," by D. A. Wright, M.Sc., at 5.30 on December 3rd.

Discussion on "How to Plan a Radio Project," opener J. Thomson, M.A., Ph.D., D.Sc., at 5.30 on December 15th.

Education Discussion Circle.—Discussion on "The B.B.C. School, Evesham," and "The Post Office School, Stone," openers K. R. Sturley, Ph.D., B.Sc., and H. R. Harbottle, O.B.E., B.Sc.(Eng.), at 6.0 on December 10th.

The above meetings will be held at Savoy Place, London, W.C.2.

Cambridge Radio Group.—"Television Camera Tubes" by R. Theile, Dr. Phil., at 8.15 on December 9th at the Cavendish Laboratory.

Merseyside and N. Wales Centre.—Discussion on "The Impact of Television on Sound Broadcasting," opener G. Parr, B.Sc., at 6.30 on December 1st at the Liverpool Royal Institution, Colquitt Street, Liverpool.

North-Eastern Radio Group.—"Harmonic Response Testing Apparatus for Linear Systems," by D. O. Burns, B.Sc.(Eng.) and C. W. Cooper, B.Sc. (Eng.) at 6.15 on December 1st at King's College, Newcastle-on-Tyne.

North Midland Centre.—Discussion on "Technique of Teaching," opener A. Machennan, at 6.30 on December 2nd at Huddersfield Training College, Queen Street South, Huddersfield.

North-Western Centre.—"Electronic Telephone Exchanges," by T. H. Flower, M.B.E., B.Sc.(Eng.), at 6.15 on December 2nd at the Engineers' Club, 17, Albert Square, Manchester, 2. (Joint meeting with the North-Western Centre of the Institution of Post Office Electrical Engineers.)

South-East Scotland Sub-Centre.—"Microwave Radio Links," by A. T. Starr, M.A., Ph.D., and T. H. Walker, B.Sc.Tech., at 7.0 on December 17th at the Heriot-Watt College, Edinburgh.

South Midland Radio Group.—"Colour Television: Some Subjective and Objective Aspects of Colour Rendering," by G. T. Winch, at 6.0 on December 1st at the James Watt Memorial Institute, Great Charles Street, Birmingham.

Southern Centre.—"Principles of Colour Television," by J. H. Mole, Ph.D., at 6.30 on December 10th at the Dorset Technical College, Weymouth.

British Institution of Radio Engineers

London Section.—"The Production of Television Receivers," by Frank Allen at 6.30 on December 10th at the London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1.

West Midlands Section.—A programme of technical films at 7.15 on December 9th at the Wolverhampton and Staffordshire Technical College, Wulfruna Street, Wolverhampton.

North Eastern Section.—"The Development of the Radio and Electronics Industry in India," by G. D. Clifford, at 6.0 on December 10th at the Institution of Mining and Mechanical Engineers, Neville Hall, Westgate Road, Newcastle-on-Tyne.

Merseyside Section.—"The Technique of Frequency Measurement in Telecommunications," by H. Hipple and A. Phipps, at 7.0 on December 18th at the Electricity Service Centre, Whitechapel, Liverpool.

Scottish Section.—"The London to Kirk o'Shotts Television Cable/Radio Link," by J. H. H. Merriman, M.Sc. (P.O. Engineering Dept.), at 7.0 on December 4th at the Department of Natural Philosophy, University, Drummond Street, Edinburgh.

Television Society

London.—"The Television Society's Transmitter"—Part I by H. Banting, H. Fairhurst and C. Banthorpe on December 11th, Part II by C. Banthorpe, D. N. Corfield and E. A. Dedman on December 17th.

Both the above meetings will be held at 7.0 at 164, Shaftesbury Avenue, London, W.C.2.

Bristol & South Western Centre.—"The Television Society's 405-line Transmitter" by H. Banting at 7.0 on December 2nd at Carwardines, Baldwin Street, Bristol, 1.

Leicester Centre.—"Electrostatics and their Applications to the Field of Television," by A. Chadfield at 7.0 on December 8th in Room 45, The Leicester College of Technology.

North Western Centre.—"Television: The Producer's View," by Berkeley Smith (B.B.C.), at 7.30 on December 17th at the College of Technology, Sackville Street, Manchester, 1.

British Kinematograph Society

Television Division.—"The Quality of Television and Kinematograph Pictures," by L. C. Jesty, B.Sc., and N. R. Phelp, at 7.15 on December 10th at the Gaumont-British Theatre, Film House, Wardour Street, London, W.1.

British Sound Recording Association

London.—"Equalizers, Filters and Tone-Control Systems," by N. H. Crowhurst, at 7.0 on December 19th at the Royal Society of Arts, John Adam Street, London, W.C.2.

Manchester Centre.—"Mechanics of Hearing," by J. E. J. John (Assistant Lecturer in Audiology, Manchester University) at 7.30 on December 15th at the Engineers' Club, Albert Square, Manchester.

Physical Society

Acoustics Group.—"Methods of Measurement of Elasticity of Solids," by G. Bradfield, at 5.0 on December 8th at the Science Museum, London, S.W.7.

Institute of Physics

South Wales Branch.—Annual General Meeting followed by "Some Properties of Electrical Contacts," by Dr. A. Fairweather (Post Office Research Station) at 2.0 on December 6th at the University College of Swansea.

North-Eastern Branch.—"Some Aspects of Transistor Physics," by Dr. H. K. Henisch (University of Reading), at 6.15 on December 2nd at King's College, Newcastle-on-Tyne.

Radio Society of Great Britain

Annual General Meeting at 6.30 on December 9th at the Institution of Electrical Engineers, Savoy Place, London, W.C.2.

Radar Association

Ringstead Radar Station Reunion at 7.30 on December 2nd at Bedford Corner Hotel, Bedford Square, London, W.1.

Institute of Practical Radio Engineers

"Syncrophase," by member of the staff of the English Electric Co. at 8.0, on December 2nd at the Wheatsheaf Hotel, Market Place, Kingston-on-Thames.

CLUB NEWS

Birmingham.—The Annual General Meeting of the Birmingham and District Short Wave Society, which is the Birmingham Chapter of the British Short Wave League, will be held on December 8th. The Society meets on the second Monday in each month at the Colmore Inn, Church Street, Birmingham. Secretary: A. O. Frearson, 66, Wheelwright Road, Erdington, Birmingham, 24.

Birmingham.—Three members of the Slade Radio Society—M. Fowler, T. J. Hayward and G. Nicholson—will give a transmitting lecture at the meeting on December 5th. Meetings are held at the Church House, High Street, Erdington, on alternate Fridays at 7.45. Secretary: C. N. Smart, 110, Woolmore Road, Erdington, Birmingham, 23.

Coventry.—In addition to the fortnightly meetings of the Coventry Amateur Radio Society, which are held at the Y.W.C.A., Queen's Road, Coventry, at 7.30 on alternate Mondays, the Society organizes a "night-on-the-air" in the top band on the second Thursday of each month at 8.0. Secretary: K. G. Lines, 142, Shorncliffe Road, Coventry.

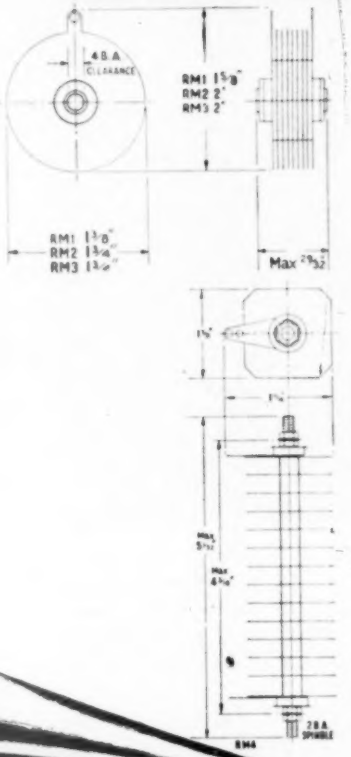
Peterborough.—A Brains Trust and a discussion on B.B.C. programmes are listed for the first two meetings of the Peterborough Radio and Scientific Society (G3DQW) for December. The Society meets each Thursday at 7.30 at its headquarters in St. Paul's Road, Peterborough. Secretary: S. Woodward, 72, Priory Road, Peterborough.

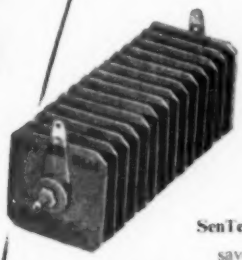
South Shields.—Meetings of the South Shields and District Amateur Radio Club are held each Friday at the Trinity House Social Centre, Laygate, South Shields, at 7.30. Secretary: W. Dennell, 12, South Frederick Street, South Shields.

Stockport.—In addition to the fortnightly meetings of the Stockport Radio Society on Tuesdays at the Blossoms Hotel, Buxton Road, Stockport, classes are now being held in preparation for the Radio Amateurs' Examination. The club membership is now 60. The next meeting is on December 9th. Secretary: G. R. Phillips, 7, Germans Buildings, Buxton Road, Stockport.

SELENIUM
SenTerCel
RECTIFIERS

miniature, lightweight
RECTIFIERS





Light, compact, **SenTerCel Selenium Rectifiers** save space . . . weight . . . assembly time . . . cost. Their many advantages add up to this imposing list :

- Less wiring.
- Unlimited instantaneous overload such as the charging current of de-formed electrolytic capacitors.
- Far lower heat dissipation.
- No "warming-up" period.
- No valve-holder.
- Practically indestructible in normal service.
- No limit to size of electrolytic capacitor.
- Saves weight.
- Saves space.
- Low in cost.

Study these **RATINGS**

TYPE	RM1	RM2	RM3	RM4
Maximum ambient temperature -	35°C 55°C	35°C 55°C	35°C 55°C	35°C 40°C *55°C
Maximum output current (mean)	60mA 30mA	100mA 60mA	120mA 90mA	275mA 250mA 125mA
Maximum input voltage (r.m.s.) -	125V	125V	125V	250V
Maximum peak inverse voltage -	350V	350V	350V	700V
Max. instantaneous peak current	Unlimited	Unlimited	Unlimited	Unlimited
Weight - - - - - -	1 oz.	1.4 oz.	2 oz.	4.5 oz.

Standard Telephones and Cables Limited

(Registered Office : Connaught House, Aldwych, W.C.2)

RECTIFIER DIVISION : Warwick Road, Boreham Wood, Hertfordshire.
Telephone : Elstree 2401 Telegrams : Sentercel, Borehamwood.

D

This Instrument may solve YOUR problem

The B.S.A. Cycle Factory in Birmingham uses the Cossor Model 1035 Oscillograph for a vital production test.
Every bicycle fork assembly manufactured at this plant is individually tested for perfect brazing at the fork headstock union by examining the undamped resonant vibrations of the assembly on the screen of the Cathode Ray Oscillograph.
This is a typical example of the innumerable problems capable of complete solution by this versatile instrument and every branch of industry is realising the potential of this apparatus in the detection and analysis of faults and the accurate monitoring of manufacturing processes. In displaying the mutual effect of two related and variable quantities simultaneously the instrument is also solving many of the fundamental problems with which Research and Development scientists are constantly beset.

In Models 1035 and 1049 the two traces are presented on a flat screen of 90mm. diameter and the amplifiers and time base are so calibrated that measurement of the voltage input as well as the time interval between various significant portions of the Oscillogram is made possible. Permanent records of these traces for subsequent analysis may conveniently be made by attachment of the Cossor Model 1428 Camera.

The Technical Advisory staff of the Cossor Instrument Division is always at your Service

ELECTRONIC **COSSOR** INSTRUMENTS

Please address enquiries:
A. C. COSSOR LTD., INSTRUMENT DIVISION (Dept. 1) HIGHBURY, LONDON, N.5.
Telephone: CANonbury 1234 (30 lines)

use COSSOR valves and tubes

C145

Reducing Fire Risks

New Method of Safeguarding Receivers

By F. R. W. STRAFFORD,* M.I.E.E.

ACCORDING to a paper by H. W. Swann[1] there were 450 fires attributed to wireless sets for the year 1950, but the table from which this figure has been extracted gives figures of 1,132 for refrigerators, 1 092 for electric fires, heaters and radiators, and 2,250 for defective or overloaded wires and cables. When one considers the enormous number of sound and television receivers in operation compared, say, with refrigerators, the figure of 450 is not unduly alarming.

Nevertheless, the *rate of increase* from 1946 to 1950 is disturbing because the rate of increase due to electric heaters and faulty cables is low and shows evidence of decline, whereas the radio fires have risen steadily from 120 (in 1946).

It is customary to connect receivers to mains-outlet sockets which are backed by either 5- or 15-amp fuses according to the type of outlet used. The maximum current drawn by receivers rarely exceeds 1 amp, so that a sustained fault may not increase the current consumption to an extent sufficient to blow the house fuses, particularly when they are of 15-amp rating. In this event an unattended receiver constitutes a severe fire risk, particularly as it is often close to inflammable curtains or furnishings.

It should be remarked that the higher incidence of fire with electric heaters, refrigerators and faulty cables may be due largely to the fact that they are often unattended and may do their evil work when all are abed. Most fires caused by electricity give early warning by pungent smells and smokes, thanks to the sulphur or phenol used in many insulators.

Since the television receiver is invariably attended, and the broadcast receiver generally so, except for neglect in switching off, the figure of 450 fires for 1950 must have arisen mainly from neglect. But neglect is the principal cause of fires, so that the set designer cannot ignore fire risk on the grounds that his is an "unattended" apparatus.

It is possible to design a receiver completely free from fire risk by removing inflammable materials. The cabinet could be pressed from metal and all components could have ceramic insulation, and all wiring could be sleeved with non-inflammable insulants. Any transformers could embody heat-operated switches to clear circuits under overload fault conditions. Obviously the suggestion is impracticable because it is uneconomic and might easily treble the cost of the receiver. Nor is it possible to provide complete protection by the use of heat-operated switches. By "heat-operated" is meant that the switch opens its contacts when the ambient temperature of the surrounding air (or materials, if it is embedded) rises to a dangerous value. In other words, the switch is not current-operated but works by radiated or conducted heat.

The heat-operated switch may consist of a pair of springy contacts tacked together with a low melting-point eutectic bead, the spring being constrained so that they fly apart when the bead melts. An alternative method is to make one contact blade rigid and to use a bi-metal strip as the other blade. Bi-metal strip is made by welding together two rectangular blocks of dissimilar metals of greatly differing thermal expansion (e.g., steel and brass) and rolling the assembly through mills to the desired final thickness, finally slitting the sheets to provide the desired strip width. On the application of heat the bi-metal flexes by curvature in the direction of the metal with the lower thermal expansion (Fig. 1).

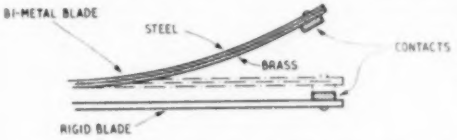
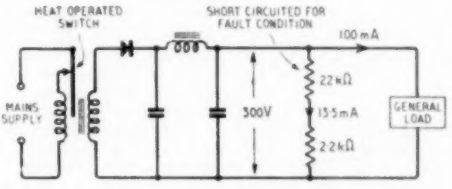


Fig. 1. Essentials of a simple bi-metal heat switch.

Fig. 2. A dangerous fault condition which may not operate the heat switch on the transformer.



The use of heat-operated switches is restricted to receivers operating through conventional mains transformers. This is because the transformer reflects the breakdown or overload of many other components in the circuits which follow it. It is only those components which give rise to increased currents when they fail which can introduce a fire risk, and increased current is reflected in the transformer as a rise in temperature which *may* operate a heat switch embodied in its windings.

It is possible to have a dangerous fault resulting in a fire in which a heat-operated switch would not work. In Fig. 2, for example, a mains-operated rectifying and smoothing circuit is drawing 113.5mA through the rectifier, of which 100mA is accounted for by the general load and 13.5mA by a subsidiary load comprising 22-kΩ and 2.2-kΩ resistors in series. The 22-kΩ resistor might be the effective anode to cathode

* Belling & Lee.

[1] H. W. Swann, "Domestic Electrical Installations—Some Safety Aspects." *Proc* I.E.E., Vol. 99, Part II, p. 255 (1952).

resistance of a valve, the 2.2-kΩ resistor being used for biasing. It is assumed that the 2.2-kΩ resistor is rated at ½ watt so that it is running within its rating. It is mounted upon a sheet Bakelite panel together with other components.

A fault condition arises which effectively short circuits the 22-kΩ resistor and the current rises to 135mA through the 2.2-kΩ resistor, an increase of nearly a hundred times the safe dissipation for it. But the current demand on the transformer has risen by a factor of approximately two, or four times the power. Owing to the thermal inertia of the bulky transformer it may be some minutes before the temperature rises high enough to operate the heat switch.

In the meantime the overloaded resistance, because of the degree of overloading and its low thermal inertia, bursts into flames and ignites the Bakelite panel which continues to burn after the resistor becomes destroyed and open-circuited by the overload. Fig. 3 is a photograph showing the result of an experiment based on the foregoing fault conditions and does not seem to warrant any further comment.

It should be remarked that resistors prone to this behaviour are of the carbon composition rod type which are unprotected. The type which are enclosed in a ceramic sleeve crack and become open-circuited before sufficient heat can be generated to ignite the Bakelite panel. This is probably due to the inequality of the expansion coefficients of the ceramic sleeve and the resistor rod, which may introduce internal stresses capable of causing a fracture.

Apart from building protective heat or current overload switches into every component, or designing them so that they cannot burn or set fire to neighbouring parts, it is impossible to allow for instances of this sort. But the example has been dwelt upon in case anyone may be misled into the belief that complete fire protection can be obtained by the use of one or two heat- or current-operated switches. A heat-operated switch placed in the roof of a receiver cabinet would be useless in such a case because the fire would be well under way before the excess temperature was conveyed to the switch. The switch would ultimately disconnect the mains supply, but not before the receiver was badly damaged. Nevertheless, a large proportion of faults, such as breakdowns of smoothing capacitors, will operate heat switches embodied in mains transformers, and they do materially reduce fire hazards wherever the transformer would have been the centre of combustion.

The simple fuse consisting of a filament of wire enclosed in a tube possesses the serious disadvantage of extremely low thermal inertia and is therefore sensitive to very brief current surges which are common in transformer and rectifier circuits. The writer discussed this problem at length in *Wireless World* some years ago.[1] Steps have been taken to improve the surge-carrying capabilities of fuses but it is still often necessary to use a higher rating than is actually required in order to avoid blowing on surges. In these circumstances a steady overload, while dangerous, may not clear the fuse before further damage or fire results. A new type of fuse, designed and used in the U.S.A. and on the Continent, consists of a heating element and a eutectic solder joint under spring tension, all enclosed in the conventional cartridge. This, however, is expensive to manufacture for consistent and reliable operation, and once blown, like all simple fuses, must be replaced.

The extensive use of a.c./d.c. technique in modern receivers still further complicates the fusing problem. The very short surges are largely removed but are replaced by longer surges (admittedly of lower amplitude) resulting from the "cold" resistance of the series valve-heater chain. Moreover, the use of metal rectifiers for h.t. supplies increases the capacitor charging surges through the smoothing circuits.

So simple fuses must still be chosen with care and must be overrated to avoid blowing on surges.

The term "cut-out" covers a very wide variety of thermo-mechanical or electro-mechanical switches whose duties may range from protecting fractional horsepower motors to power sub-stations supplying many thousands of kVA.

Cut-outs must not be confused with thermostats, which are regulating switches designed to maintain an operating temperature within close limits in spite of variations in ambient temperature. The cut-out is designed to operate on a dangerous thermal and/or current overload, and to remain open until the danger has passed. In some cases it is returned to its operating condition by hand; in others it automatically "cuts-in" depending on the application.

In general the cut-outs used in the electrical industry are fairly complicated and quite expensive when compared with the cost of a radio fuse plus its mounting arrangement. Allowing for the replacement of a few fuses over a period of years the cost of the cheapest cut-out for protecting a small motor is many times greater. On the other hand, the operating properties of cut-outs lend themselves ideally to radio and electronic circuit protection. For this type of application they have the following highly desirable features:

(a) The ability to withstand momentary overloads of 30 to 40 times their rated current.

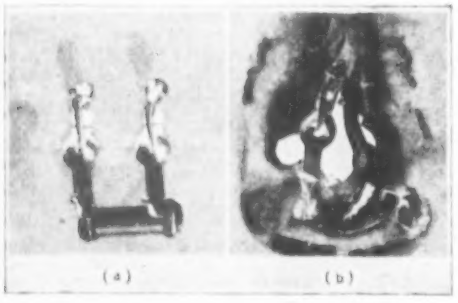
(b) The ability to operate at high temperatures with and without current overload.

(c) The ability to be reset after the fault has been cleared without the risk (as with fuse replacement) that an incorrect rating may be substituted.

(d) A clear indication that they have opened (a fuse filament is often difficult to see and must be given some electrical continuity test).

The question remains whether these features can be retained when the cut-out is designed to operate on the lower current ranges from 100mA to 1 amp, and when its construction is miniaturized, and, most important, when it is made suitable for mass produc-

Fig. 3. Burning of Bakelite panel by grossly-overloaded resistor: (a) the resistor before; (b) after burning.



[1] F. R. W. Strafford, "Mains Transformer Protection," *Wireless World*, February, 1947, p. 51.

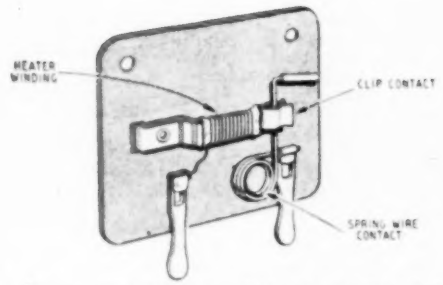


Fig. 4. Heat-operated overload cut-out designed for protection of receivers, shown slightly over actual size.

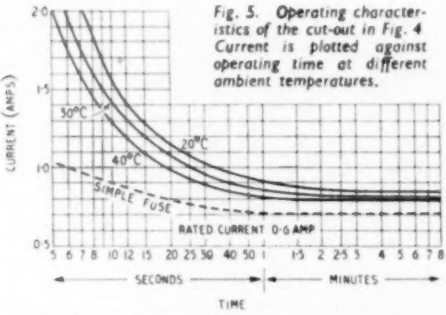


Fig. 5. Operating characteristics of the cut-out in Fig. 4. Current is plotted against operating time at different ambient temperatures.

tion techniques. It has been found possible to achieve these requirements in performance and size while maintaining something which can be produced economically.

Fig. 4 is a full-scale sketch of a simple cut-out* expressly designed for radio receiver circuit protection, but it has many other obvious applications in electronic equipments and instruments. The basic feature is the use of a contact clip constructed from a single piece of bi-metal strip folded back upon itself. It is folded so that the higher expansion metal is on the inner faces and the clip opens at its extremity upon the application of heat. The other contact is a piece of spring wire with a "safety pin" curl at its hinge. The straight portion engages in the clip and the end is bent over and carries a coloured sleeve to draw attention to a "cleared" fault. A heater winding wound over an asbestos former completes the device and is in series with the contacts. The initial pressure of the bi-metal clip and the amount of tension on the spring have been chosen to fulfil the following requirements:

(a) To remain in contact when carrying the rated current and subjected to bump and vibration tests in accordance with specification R.I.C.11.

(b) To remain in contact under normal rated conditions with surrounding temperatures up to 50°C—thereby making the operation independent of room temperatures ranging from a coal-less winter to a summer heat-wave!

The thermal inertia of the heater and bi-metal strip assembly is such that an overload of at least 40 times the rated current can be sustained without opening circuit or causing damage for a period of one-fiftieth of a second. When a circuit protecting device is included in the primary of a mains transformer in a receiver overload currents of the above order and duration can occur, as pointed out in the earlier *Wireless World* article. Further, the thermal inertia also permits harmless overloads of a few hundred per cent which persist only for a few seconds.

The curves in Fig. 5 bring out these points, while the broken-line curve is that obtained by the use of a simple silver-filament fuse of the same rating, namely, 0.6 amp. For blowing times less than 5 seconds (not shown in Fig. 5) the overload required to operate the cut-out rises enormously as compared with that of the simple fuse which continues to rise fairly linearly until operating times of less than 0.5 second are reached. The curves show that, while the ambient temperature has a slight effect upon the normal operating conditions up to about 60 seconds, the curves begin to close up at the longer times, that is, under normal "no fault" conditions.

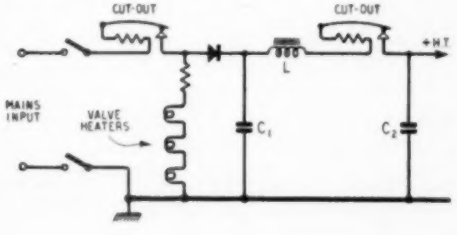
The cut-out must also be capable of dissipating considerable spark energy, for it may often be used in a d.c. circuit including a fairly large inductance, for example, a smoothing inductance of 30 henries. The breaking of such a circuit will produce a large back e.m.f., and unless a wide separation of the contacts is effected at high speed an arc is likely to strike and hold with disastrous results to the contacts. These considerations have been taken into account in the design, and 200 mA of d.c. at a pressure of 350 volts can be interrupted through a 30-henry choke without damaging the contacts.

It is possible to achieve a range of ratings for the cut-out between 100 mA and 1 amp with a dissipation as low as 0.3-0.4 watt in the heater winding. When a number of the cut-outs are required this dissipation is an important matter. But when one remembers that the general run of equipments have power consumptions of anything from 25 watts upwards, it will be seen that the dissipation is reasonably small.

It is important that the cut-out be compact and preferably flat so that it may be fixed in a chassis tray or otherwise made inaccessible to the unskilled user. It would be manifestly unwise to place a device with obvious resetting facilities in an accessible position. Preferably, it should be placed close to the component it is most likely to operate in the event of breakdown, as this will assist the servicing technician in tracing the fault quickly. It is likely to be used in direct association with mains transformers, reservoir and smoothing capacitors, and possibly in the cathode circuit of certain valves where high peak-to-peak anode currents occur and there is a greater possibility of a breakdown.

The question of where to introduce the cut-outs into

Fig. 6. Useful positions for two of the cut-outs in an a.c. d.c. receiver circuit.



* Patent pending.

a circuit is rather difficult to answer. As a rough guide, the mains input circuit, backed by 5- or 15-amp household fuses, must be given first consideration. A fair proportion of major faults are reflected as a moderate rise of current in this circuit, particularly in a.c./d.c. techniques or where a mains transformer of good regulation (low internal resistance) is used. Reservoir and smoothing capacitors for the h.t. supply are vulnerable points and must not be overlooked. The e.h.t. supplies to cathode ray tubes are not so serious because of the low currents involved and the poor regulation of the associated circuits. Thus, a fair degree of protection may be afforded by a single cut-out in series with the mains input, while a considerable improvement may be effected by another one in series with the h.t. smoothing capacitor.

Fig. 6 is part of the basic circuit of an h.t. supply to a broadcast receiver, based on a.c./d.c. technique, in which two cut-outs are included. The one in series with the mains supply will cope with a short circuit of the rectifier or the reservoir capacitor C_1 individually or collectively. The one in series with the smoothing choke, L, will be actuated by a short circuit of the smoothing capacitor, C_2, or any excessive load caused by component short circuits which can reflect 100 per cent or more current overload into the cut-out winding. The example shown in Fig. 2 and described in the text would be an exception. Provided that care is taken in the selection of such vulnerable components and their positioning with respect to inflammable materials the fire hazard due to their breakdown will be small, possibly negligible.

Flat Television Magnifier

More Efficient Utilization of Screen Area

By N. A. de BRUYNE,* M.A., Ph.D., F.Inst.P.

LORD RAYLEIGH showed that there are circumstances in optical instruments where there is no need to magnify much or even at all in one plane† and that there may be an unnecessary loss of light by so doing.

With this in mind it occurred to me that the use of a conventional magnifying lens in front of a television screen was not perhaps the best way of obtaining an enlarged image. It would be preferable to increase the height of the real image on the screen by adjustment of the controls and then to place a cylindrical lens in front of this distorted image. In this way the circular screen could be used efficiently with a wide angle of view in a vertical plane.

Fig. 1 (a) shows the image on the screen of a 9-in diameter tube with a picture of aspect ratio 4:3 and dimensions 7.5in wide and 5.6in deep. As will be seen the circular screen is not very efficiently used. A square picture of a 7.5-in side as shown in (b), in which the corners lie outside the screen, will give an increase of twenty per cent in the area used and hence in the total light output from the screen. Admittedly the corners of the picture are lost, but in all

* Aero Research, Ltd.

† Scientific Papers, Vol. V, 1902-1910, p. 442, published by Cambridge University Press, 1912.

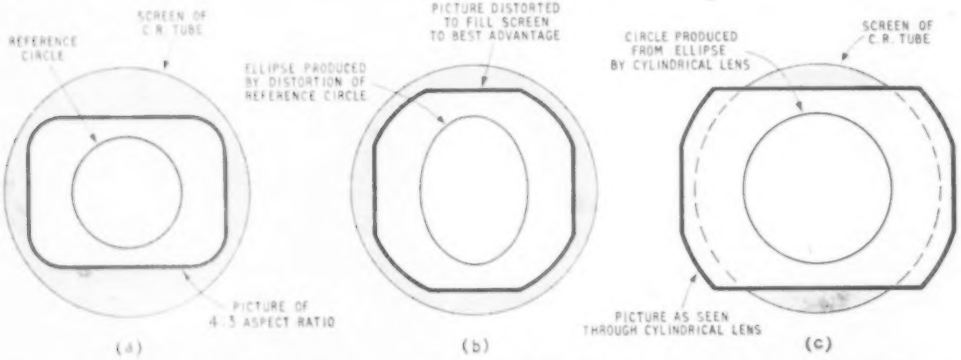
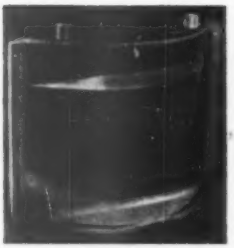
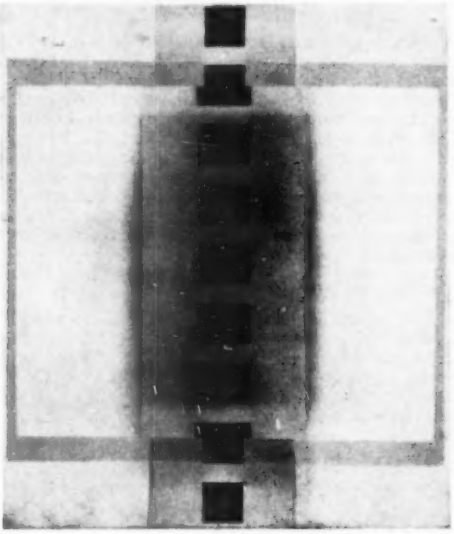

REFERENCE CIRCLE
SCREEN OF C.R. TUBE
PICTURE OF 4:3 ASPECT RATIO
(a)
ELLIPSE PRODUCED BY DISTORTION OF REFERENCE CIRCLE
PICTURE DISTORTED TO FILL SCREEN TO BEST ADVANTAGE
(b)
CIRCLE PRODUCED FROM ELLIPSE BY CYLINDRICAL LENS
SCREEN OF C.R. TUBE
PICTURE AS SEEN THROUGH CYLINDRICAL LENS
(c)

Fig. 1. Illustrating the action of the magnifier. (a) The picture as normally displayed, with a circle drawn to represent a circular object in it. (b) The picture has been distorted by the height control into a square with rounded corners, and the circle has become an ellipse. (c) The distortion is removed by horizontal magnification and the picture is now seen as in (a) but enlarged.



Left : Fig. 2 Experimental plano-convex cylindrical lens partially filled with liquid paraffin.

Below : Showing the effect of the flat magnifier on a line of 1-in black squares. The enlargement is in the horizontal direction only and it draws the squares out into rectangles of approximately 4 : 3 aspect ratio.



direct viewing receivers the corners are rounded off by a mask anyway.

In the square-shaped image the picture will be distorted and the familiar clock face will appear elliptical. To restore the picture to its correct aspect ratio it is necessary to put a cylindrical lens in front; or in more general terms to view the picture through a suitably astigmatic optical system. This lens will absorb light, but one always uses a protective screen to guard against implosion so there need be no additional loss due to it. The effect of the cylindrical lens is to give a virtual image 10in wide by 7.5in deep, as shown in Fig. 1 (c).

Initially I used a plano-convex cylindrical lens made of Perspex sheet cemented with a glacial acetic acid and filled with liquid paraffin, as shown in Fig. 2. This is quite easily made as the Perspex has only to be bent to a single curvature as compared with the double curvature of an ordinary magnifying lens. I used a saucepan of about six inches diameter as a pattern round which to form the front sheet. This cylindrical lens gave satisfactory results but is rather clumsy.

A far better method is to use a Fresnel lens made as a flat sheet. Such a lens was made for me by Techne (Cambridge), Ltd., of Duxford, Cambridge, and it has all the properties of a cylindrical lens. It consists of a large number of parallel rulings on the surface of a ¼-in sheet of Perspex, each ruling being a narrow prism. It is in fact a stepped cylindrical lens similar in principle to a lighthouse lens. Each prism is 0.4mm wide and its angle corresponds to that of an equivalent cylindrical lens of plano-hyperbolic shape. Since the edges of these prisms are invisible at distances greater than about twelve inches, one is unaware of the presence of the vertical rulings and the effect is the same as though one were looking through a smooth cylindrical lens.

ARMY EMERGENCY RESERVE

TO ensure that a man's peace-time skill will be used to the best advantage by the Army in an emergency, the Supplementary Reserve has been reconstituted as the Army Emergency Reserve. Units of the A.E.R. are raised on a trade or "skill" basis and not territorially as is the case with the Territorial Army, and there is no provision for regular training other than a 15-day camp each year. Elsewhere in this issue we publish a letter from the Officer Commanding the Army Wireless Reserve Squadron formed to enlist the services of radio amateurs and others with operating and technical experience. At present the age limits for enlistment are 18-42 and the period of service varies from two to four years. There is a bounty of £9 p.a. for Other Ranks, and in addition, allowances at ordinary army rates and travelling expenses for the annual camp.

It is also planned to form a Wireless Reserve Pool, for which there is no training, and, therefore, no bounty. Particulars of the Wireless Reserve and the Pool are obtainable from the Commandant, Col. R. H. Copeland, H.Q., A.E.R., Royal Signals, Blacon Camp, Chester.

The A.E.R. is also in need of technicians to maintain radar and other electronic equipment in R.E.M.E.

Information about all sections of the A.E.R. and methods of joining can be obtained from any Army Recruiting Office or from the War Office (AG10), London, S.W.1.

Manufacturers' Literature

Constant-frequency A.C. Supply, using a crystal oscillator, frequency dividers and amplifier to give a 50-c/s output stable to within 0.001 per cent. Three models are available, with outputs of 10, 50 and 100 watts. Described in a leaflet from Radio-Aid, Ltd., 29, Market Street, Watford, Herts.

Small Soldering Iron (weight 4oz) with adjustable bit described briefly in a leaflet from Kenroy, Ltd., 152, Upper Street, London, N.1.

Flexible Coaxial Cables; double braided type for preventing leakage at high frequencies and non-microphonic type for reducing parasitic voltages generated by flexing and vibration. Characteristics and nominal dimensions of both types given in a leaflet from The Telegraph Construction and Maintenance Co., Ltd., Telcon Works, Greenwich, London, S.E.10.

Transmitting Capacitors for medium- and high-power working; constructed on ceramic tubes with glazed rims for reducing voltage gradients and corona losses. Technical Bulletin No. 26 from The Telegraph Condenser Co., Ltd. (Radio Division), North Acton, London, W.3.

Television Aerials and accessories; a catalogue of loose leaflets from Wolsey Television, Ltd., 75, Gresham Road, Brixton.

Hermetically Sealed Terminals; wire terminal posts sealed into metal mountings by insulating globules of glass. Various shapes and sizes listed in a booklet "Glass-Metal Seals" from The Edison Swan Electric Co., Ltd., 155, Charing Cross Road, London, W.C.2.

Sapphire Gramophone Needles; discussion of their characteristics and brief descriptions of four new IM types: "standard" for insertion at an angle, "trailer" for vertical insertion, "miniature" for light-weight pickups and "microgroove" for 33⅓-r.p.m long-playing records. Leaflet from Alfred Imhof, Ltd., 112-116, New Oxford Street, London, W.C.1.

Crystal Microphones; a catalogue giving specifications and response curves of their most popular types from Ronette, Piezo-Electric Industry N.V., Amsterdam, Holland.

Microphony in Superhet Oscillators

By H. STIBBÉ,* A.M.Brit.I.R.E.

Part 1—What Causes It

SINCE the advent of the superheterodyne receiver in the 1930s the greater sensitivity and adjacent channel selectivity of domestic receivers, particularly on the short wave bands, have considerably increased the risk of microphony. In particular, oscillator microphony tends to be very troublesome. The degree of freedom from oscillator microphony which will be achieved in production cannot be predicted at all accurately during the design period, but by taking suitable precautions in the design the amount of work and modification necessary during the development period can be very considerably reduced. Unless proper precautions are taken there is a real danger that the mechanical design of the receiver may have to be revised at a time very close to the start of production, and, indeed, it may prove impossible to achieve the required degree of freedom from oscillator microphony in time for production.

Mechanism of Microphony

Before attempting to devise ways and means of reducing oscillator microphony, it is obviously essential to understand its mechanism. Consider a constant-amplitude unmodulated r.f. signal at the aerial terminal of the receiver. The resulting i.f. signal produces a constant d.c. voltage at the output of the diode detector. The magnitude of this voltage (if the signal is large) is directly proportional to the amplitude of the i.f. signal producing it.

A typical i.f. response curve (measured at the control grid of the frequency-changer) is shown in Fig. 1. If the receiver is not quite correctly tuned, as may easily happen on the short wave bands, especially if the local oscillator drifts in frequency, then an ordinate erected on the incorrect i.f. so produced may intersect the curve on one or other of its flanks. If the oscillator is now frequency modulated to an extent such that its maximum frequency excursion does not cause the i.f. produced to move beyond the head of the curve of Fig. 1 there will be an alternating voltage superimposed on the d.c. output of the detector at the same frequency as the modulating signal, due to the i.f. amplifier and diode detector together acting as a frequency discriminator or demodulator. The a.c. component of the detector output will be fed to the speaker after amplification. If the frequency is within the range capable of reproduction by the speaker, a sound of this frequency will be emitted. If the sound energy vibrates a component in the oscillator circuit whose position determines the frequency of the oscillator, then this will cause frequency modulation of the oscillator at the same frequency as that of the original source of frequency modulation. And if the acoustic feedback is such that the resulting frequency modulation is in phase with that already produced (by the original source) then the frequency modulation will be sustained, provided that the feedback to the frequency-determining component of the oscillator circuit is sufficiently large.

If this is the case the original source of frequency modulation is not required, and whenever the receiver is switched on and suitably detuned from the r.f. carrier there will be a sustained a.f. output from the speaker. This is the phenomenon of oscillator microphony.

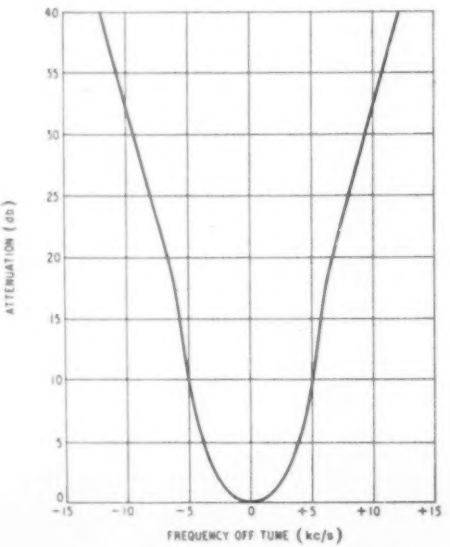
Methods of Prevention

The prevention of oscillator microphony may be achieved either (*a*) by preventing the i.f. amplifier and detector from acting as a frequency discriminator or by reducing their sensitivity as such, or (*b*) by reducing the feedback between the speaker and the frequency determining component(s) of the oscillator circuit.

Since the sensitivity of the discriminator formed

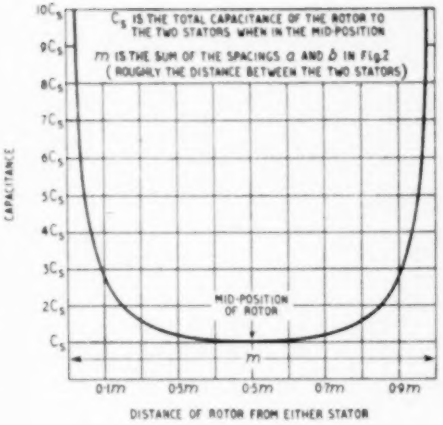
* Bush Radio, formerly Philips Electrical (Mitcham Works).

Fig. 1. Typical i.f. response curve measured at the control grid of the frequency-changer.



Left : Fig. 2. Representing a rotor plate and its two adjacent stator plates in a tuning capacitor.

Right : Fig. 3. Graph showing how the capacitance of a rotor plate to its adjacent stator plates varies with the position of the rotor plate.



by the i.f. amplifier and detector is proportional to the slope of the flanks of the overall i.f. response curve, microphony can be reduced by decreasing this slope. This, however, would worsen the adjacent channel selectivity and can hardly be recommended as a cure, except that the shape of the flanks should be made no greater than is necessary to obtain the required adjacent channel selectivity.

The slope of the curve flanks in an over-critically coupled i.f. amplifier is equal to that of the same amplifier with the same inductances, capacitances and Q-factors in the transformers but using critical coupling. As is well known, the head of the response curve of an over-critically coupled i.f. amplifier is broader (for a given reduction in gain, say 3 db) than that of a critically coupled amplifier, and double-humping occurs. The use of such an amplifier does not reduce microphony once it starts, but the oscillator has to drift (or be detuned) further than with the critically coupled amplifier in order to bring the ordinate of the incorrect i.f. produced to a position where it will intersect the steep flank of the response curve. If the oscillator drift can be kept small enough the use of an over-critically coupled amplifier may prove to be an advantage. In such an amplifier the coupling factor of the transformers should be made as high as possible, consistent with not making the trough in the response curve too deep, so that the peak separation is large; then a relatively large amount of drift is required to provoke the receiver into microphony.

Susceptible Component

The component which is perhaps the most susceptible to microphony in the oscillator circuit is the tuning capacitor. Vibration of either the rotor or stator plates will cause changes in its capacitance. Consider any one rotor plate and the two adjacent stator plates with the notation of Fig 2. If the stators are fixed the sum of the distances a and b is constant and independent of the position of the rotor between the stators. Let $a + b = m$. The capacitance of two parallel plates is k/d, where k is a constant determined by the area of the plates and the permittivity of the medium separating the plates, and d is the distance between the plates. Then the capacitance of the rotor plate to the stator plates is

$$C = k\left(\frac{1}{a} + \frac{1}{b}\right) = k\left(\frac{1}{a} + \frac{1}{m-a}\right) = \frac{km}{am - a^2}$$

It is obviously desirable that the rate of change of C with respect to a be a minimum in the interests of freedom from microphony. Equating $\frac{dC}{da}$ to zero, we have

$$\frac{dC}{da} = \frac{km(m-2a)}{(am-a^2)^2} = 0$$
$$\therefore \quad m = 2a$$

This shows that the best position for each rotor is exactly midway between the adjacent stators. Fig. 3 is a graph of the total capacitance of a rotor plate to the two adjacent stator plates as a function of the distance from the rotor to either of the two stators; the m is the sum of the distances from the rotor to each of the two stators as in Fig. 2. From Fig. 3, we can see that for one complete cycle of oscillation of the rotor about its position of rest, when this position is exactly midway between the adjacent stators, there will be two complete cycles of capacitance variation. Therefore there will be two complete cycles of frequency modulation, thus producing at the output of the detector a signal whose frequency is twice that of the rotor excitation. However, it is quite safe to say that in practice the rotor plates are never exactly centrally spaced between the stators, and from Fig. 3 it will be seen that for each cycle of vibration of the off-centred rotor there will be one cycle of capacitance, and hence frequency variation, and sustained microphony may be set up.

The frequency of the microphony due to the vibration of the rotor plates is their mechanical resonant frequency, which is often of the order of 2kc/s. Should the split end vanes (used for law adjustment in manufacture) be instrumental in producing microphony they may vibrate at a rather higher frequency, but it is difficult to determine from just the frequency whether it is the end vanes or the others which are vibrating.

We will now consider the order of capacitance change required on the short wave band to alter the oscillator frequency by a few kc/s. Suppose a receiver is tuned to a signal of frequency 6Mc/s, and the i.f. is 470kc/s. The oscillator frequency will be 6.47Mc/s. In order to cause detuning of the oscillator by 6.47kc/s (1 part in 10^3) the change in tuning capacitance must be 2 parts in 10^3. Assuming a total tuning capacitance of 500pF, the required change is

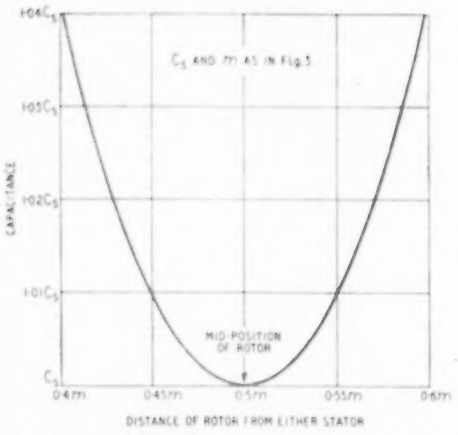


Fig. 4. Small portion of Fig. 3 drawn on a larger scale to show the rapidity of capacitance change as the rotor is decentred.

1pF. When it is realized that the order of the distance separating a centrally spaced rotor plate from the adjacent stator in a typical tuning capacitor is 0.01in, it will be appreciated that only a very small plate movement is required to produce a change of 1pF in the capacitance.

The order of magnitude of this movement will now be examined. If each rotor plate is asymmetrically spaced only to the extent that it is 0.009in from one adjacent stator and 0.011in from the other, the total capacitance will be

$$C = Nk\left(\frac{1}{11} + \frac{1}{9}\right) = \frac{20.2\,Nk}{100}$$

where k is a constant and N is the number of stator plates (when the outside plates of the capacitor are both rotors). For an increase of 0.2% in the total capacitance, if all the rotors move identically

$$C = Nk\left(\frac{1}{a} + \frac{1}{20-a}\right) = 1.002\,\frac{20.2\,Nk}{100}$$
$$= \frac{20.24\,Nk}{100}$$

where a is the spacing (measured in thousandths of an inch) between each rotor and its nearest stator.

$$\therefore \frac{20}{20a - a^2} = \frac{20.24}{100}$$
$$\therefore \quad a = 10 \pm 1.089$$

For a decrease of 0.2% in the capacitance

$$\frac{20}{20a - a^2} = \frac{20.16}{100}$$
$$\therefore \quad a = 10 \pm 0.89$$

Thus with the spacings of 0.009in and 0.011in from each rotor plate to each of its adjacent stator plates respectively, a movement of all the rotor plates towards the nearer stators of 0.000089in and a movement away from them of 0.00011in will produce a frequency modulation of approximately 6.5kc/s when the receiver is tuned to an incoming signal of 6Mc/s. A small portion of Fig. 3 is redrawn on a larger scale in Fig. 4 to show the rapidity with which $\frac{dC}{da}$ increases as the rotor plates are decentred by even a small amount.

These calculations are not presented with the idea of calculating with any exactness the magnitude of the physical movements of the plates. This is not practicable, for some plates may be spaced asymmetrically by greater or larger amounts than those chosen in the example given; moreover some plates may be spaced asymmetrically in opposite directions from others, and may vibrate with different amplitudes. The calculations serve only to illustrate the extreme susceptibility of the tuning capacitor in producing sustained oscillator microphony.

(To be concluded)

Micro Switches

SWITCHES operated by very light pressure or by a very small movement or by a combination of both have come to be known colloquially as "micro switches." In the case of the range made by Bulgin, which are based on the design of the Acro snap switches made by the Acro Manufacturing Co. of America and interchangeable with this make, they are known as micro-sensitive switches.

The unusual mechanism employed enables the switch to be operated with as little as 1½ oz of pressure and with a movement as small as 15 thousandths of an inch, yet the switches are robust and capable of handling quite large currents, up to 10 A if necessary.

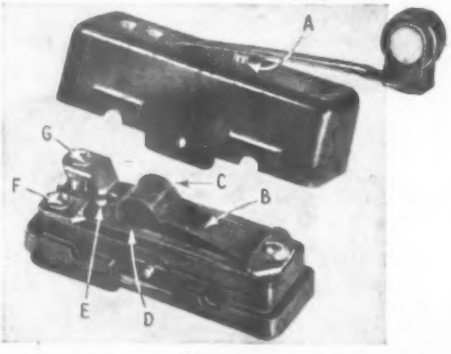
Every switch is basically a single-pole two-way and it can be used as on/off, off/on or changeover. Heavy silver contacts are fitted and all spring leaves are made of beryllium copper.

Briefly, the mechanism of the switch is that an insulated stud A compresses a spring leaf B and after a small movement an intermediate spring C, held under tension by contact with the leaf D, snaps down and causes the two electrical contacts E and F to fly apart. In so doing the moving contact E snaps hard against the other fixed contact G. Release of the pressure reverses the sequence.

Various schemes have been evolved to translate rotary, oscillating and sideways movements of the actuating bodies into the limited up-and-down motion necessary to operate the switch; levers, cams, rollers and other devices being pressed into service, thus enabling the switch to be used for a multitude of functions.

A wide range of models are made, covering requirements of high or low current and voltage, light or relatively heavy operating pressure and large or small travel of the actuating stud.

The makers are A. F. Bulgin & Co., Ltd., Bye-Pass Road, Barking, Essex.



Internal mechanism of the Bulgin micro-sensitive switch.

MARCONI communication systems

serve mankind

The need to keep in touch is as essential for the scattered look-outs of a forest empire as it is for the offices and homes of a crowded metropolis. What is the best way to go about it? How much will it cost to install? . . . to maintain? It is to such questions that Marconi's will be glad to give the relevant answers, drawn from unrivalled experience in communications all over the world.

SURVEYED

PLANNED

INSTALLED

MARCONI'S WIRELESS TELEGRAPH COMPANY LTD · CHELMSFORD · ESSEX

EDISWAN

CLIX

By adding the Clix range of radio, television and electronic components to its existing list of products The Edison Swan Electric Co., Ltd. is able to offer an improved components service to the radio industry. Future enquiries and orders for these products, and others in the Ediswan range, will be welcomed.

United for better Radio, Television & Electronic component service

THE EDISON SWAN ELECTRIC COMPANY LIMITED

155 Charing Cross Road, London, W.C.2, and branches

Member of the A.E.I. Group of Companies

129

Soldering Technique

Abstract of a Technical Paper Dealing with Industrial Methods

MANY interesting details on solder and soldering are given in a paper* read at the Australian Institution of Radio Engineers earlier in the year. Being unable to attend in person yet wishing to retain the personal touch the author recorded the address and sent it to Australia for reproduction at the meeting. As its title implies, the paper deals with industrial soldering and in particular the technique used in the British radio industry, though all users of soldering irons will find in it much of general interest and instruction. A knowledge of the characteristics and qualities of the materials and tools employed cannot fail to make soldering more interesting and improve the quality of the work.

Correct selection of the tools for every job is important and soldering is no exception. Quite early in the paper consideration is given to the various types of soldering irons and the advantages and disadvantages are discussed at some length of electrically-heated types, heating by gas or electric muffles and gas-heated irons.

Bit Temperature

The correct temperature of the copper bit is often overlooked, or dismissed too casually, but not so in this paper. It has an important bearing on the life of the bit and incidentally the iron itself. Excessive heat radiated from the iron can be very distressing to the user especially over long periods of time.

For most radio production purposes it seems that a bit temperature of about 40 deg C above the liquidus, or free-flowing temperature, of the solder is a satisfactory target. This information is not always available, since the usual custom is to rate irons on the basis of the watts consumed, and it is explained in the paper that different irons of the same wattage can show very wide variations in bit temperature.

When dealing with one of the more undesirable effects of bit temperature, the author says . . . "More harm has been done to components such as resistors and condensers by using too low a bit temperature than a too high one. If a low bit temperature is used there is a tendency to keep the iron on the component much too long so as to obtain a satisfactory joint, with the result that the heat is conducted down the wire to the vital part of the component." The use of thermal shunts is not discussed but perhaps these useful devices are a little too clumsy for assembly-line production.

The melting point, or more strictly speaking the solidus, of all tin-lead solders is given as 183 deg C . . . "but there is a variation in the plastic range of 43 deg C between the solidus and liquidus of alloys having tin contents between 60 and 40 per cent. Incidentally, when quoting alloys the tin content is always mentioned first.

"It is practicable in radio and television assembly to use any alloy having tin contents between 63 and 40 per cent. No useful purpose is served in using an alloy having a higher tin content than 63 per cent because such an alloy has a higher melting point than 63/37. At first glance it would seem that the 'ideal' alloy to use would be the eutectic, that is 63/37 alloy. The eutectic alloy has no plastic range, it changes instantly from solid to liquid at 183 deg C whereas all other alloys have a variation between the solidus and liquidus temperatures." Liquidus state is the free-flowing condition.

When comparing the qualities of the different usable alloys for solder the standard one nearest to the eutectic, namely 60/40, is said to be the one most commonly used in England by the radio industry since it has the lowest melting point, but as the author says . . . "As the cost of tin is five to seven times that of lead, there is obviously good reason for considering the use of the lower tin content alloys than 60/40. Providing sufficient bit temperature is available there is no reason why an alloy having as low as 40 per cent tin cannot be used. One manufacturer using 40/60 alloy states that the average consumption of 18 s.w.g. is one ounce of solder per two hundred joints." It should be understood that throughout this paper all references are to the flux-cored solders.

Against any economy effected by the use of a lower tin content it has to be remembered that lead is the heavier constituent, so that with more lead the total amount of solder wire in a pound by weight is less than with a higher tin content. This is an important point well brought out in the papers. For example, it is stated . . . "for 16 gauge in 60/40 alloy 98 feet to the pound is obtained, whereas in 40/60 the length is 91 feet to the pound. This means that for the lower tin content alloy 7 feet of solder is lost."

An interesting sidelight on the use of widely dissimilar alloy solders is seen in the following passage . . . "For some soldering purposes where it is required to make two joints to opposite ends of a tag at different times and there is a possibility of the solder on the first joint being melted when the second joint is made the difficulty can be overcome by using pure tin for the first joint and a standard tin/lead alloy for the second. Alternatively, if careful technique is observed a 20/80 alloy could be used for the first joint."

The use of solder with coloured fluxes is mentioned in passing, it being said that some advantages can be found where part of the sub-assembly is done by sub-contractors and the final assembly by the main constructor. Coloured fluxes enable the final inspection to establish responsibility for specific joints.

A great deal of useful data has perforce had to be omitted from this brief synopsis, but it is hoped enough has been said to give some idea of the scope and nature of the paper. Soldering is a much-neglected, but all-important, subject.

Printed copies of the transcription can be obtained from Multicore Solders Ltd., Multicore Works, Maylands Avenue, Hemel Hempstead, Hertfordshire.

*"Considerations of Soldering Technique in Radio and Television Assembly." by Richard Arbib, Multicore Solders Ltd.

Two-Range Test Oscillator

By H. B. DENT

New Approach to the Problem of Switching Radio-Frequency Circuits

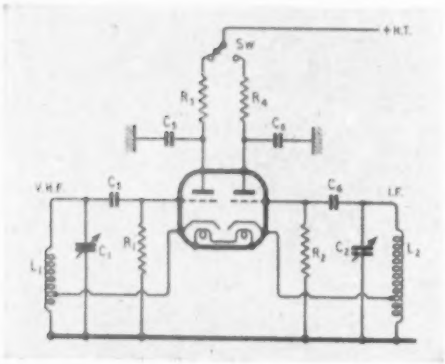


Fig. 1. Basic circuit of the double-triode two-range oscillator.

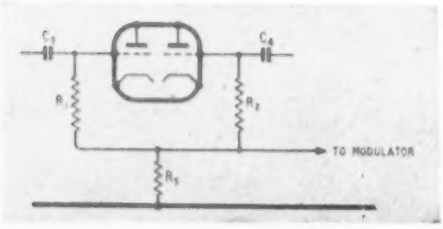


Fig. 2. Method of applying modulation to the double-triode oscillator.

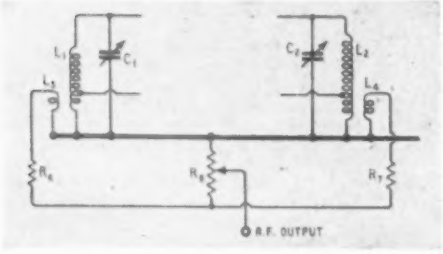


Fig. 3. R.F. output circuit of two-range oscillator which obviates switching.

WHILST thinking over the design for a simple two-range modulated test oscillator and wondering how best to arrange the band switching—for one range had to cover 100 Mc/s and the other 10 Mc/s—the idea emerged to use a double-triode valve with each section functioning as a separate oscillator and for range selection switch the h.t. supply to the appropriate anode. The basic idea is shown in Fig. 1, where L_1C_1 is a v.h.f. oscillator and L_2C_2 an i.f. oscillator and the two tuning capacitors C_1 and C_2 are the two sections of a split-stator variable capacitor.

A single tuning dial serves for both ranges and the actual frequency scales can, if desired, be marked directly on the dial, one half accommodating the 100-Mc/s band and the opposite half the 10-Mc/s one.

Duplication of parts may seem extravagant, but the total number is small and the range switch a simple

Some idea of the compactness of the unit is obtainable from this view.

single - pole changeover toggle, whereas for switching the actual r.f. circuits a low-capacity ceramic wafer type, or something similar, would have to be used. Thus the ultimate cost is very much the same in both cases, but the double triode scheme has the advantage that it permits a more satisfactory layout of the r.f. circuits.

Tone modulation was required and of the several ways in which it could be applied that shown in Fig. 2, which is a simple form of grid modulation, is adopted. The grid leaks R_1 and R_2 of the two oscillators are connected to a common resistor R_3, one end of which is connected to the earth line and the modulating signal applied across this resistor. It has the advantage that no switching is required apart from an on-off switch for the modulator and this is in the h.t. supply to the valve.

Switching is avoided also in the output circuits of the oscillators by employing a small pick-up coil coupled to each oscillator, L_3 and L_4 in Fig. 3, and connecting them, via isolating resistors R_4 and R_5, to

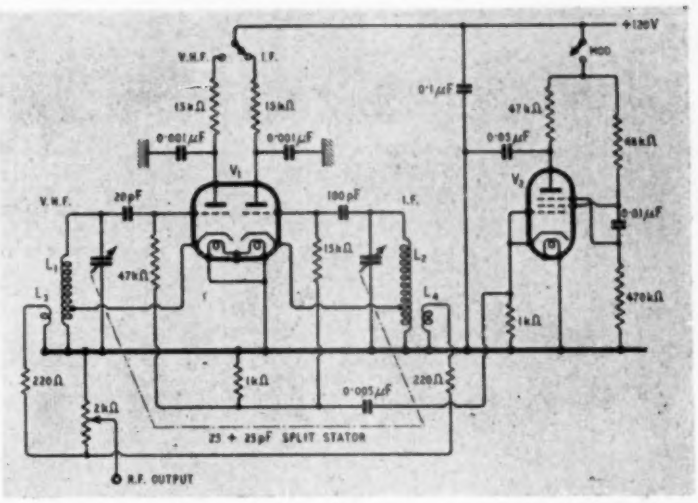
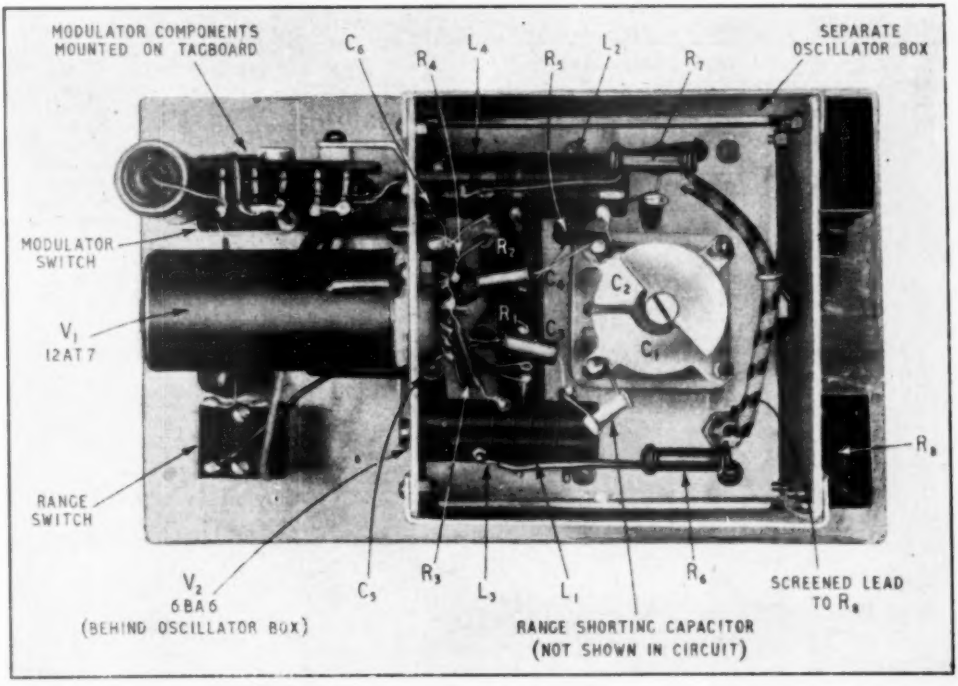
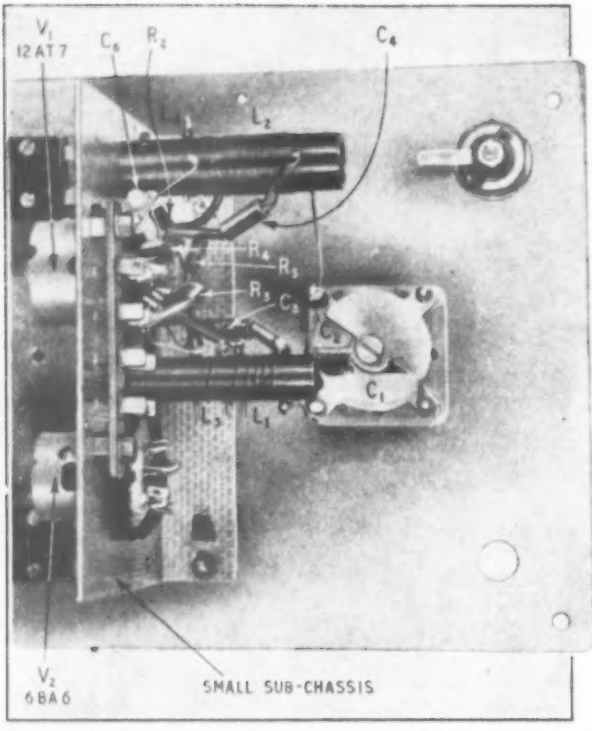


Fig. 4. Complete circuit diagram of the two-range oscillator and transitron modulator.

In this model the r.f. oscillator is separately screened. Modulator valve (not shown) is between this box and the panel. An insulated coupler is used for the two capacitors. The tag board to the right of the oscillator valve carries the modulator components.





Partially built alternative unit with modulator and oscillator valves side by side on a small sub-panel. R.F. oscillator not separately screened.

a potentiometer output control R_6, which is common to both ranges.

No attempt has been made to fit a calibrated attenuator, although apart from the difficulty of making one that behaves rationally at 100 Mc/s with limited facilities, there is no reason why some device of this kind should not be employed.

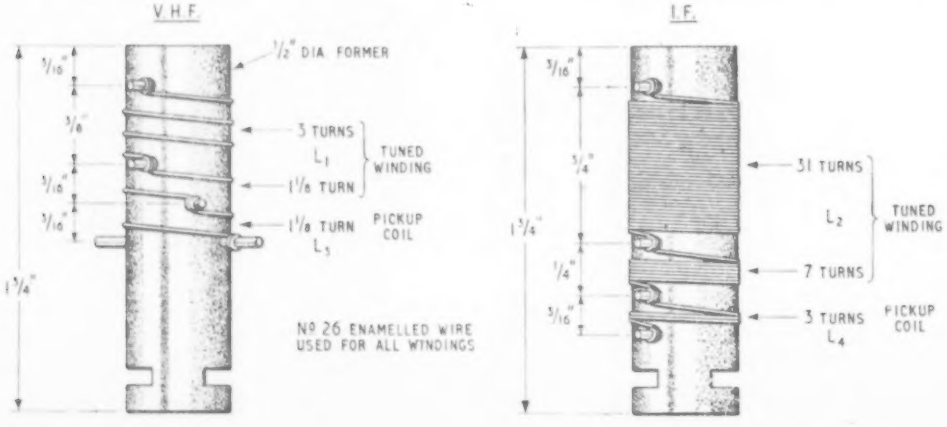
The oscillators and the modulator are required to fit into a small metal box measuring 7 in × 4 in × 5 in deep, and it is necessary therefore to avoid the use of bulky items and employ miniature parts throughout. A small enough iron-cored coil was not available at the time, so a type of a.f. oscillator was sought that did not require a large inductance. A satisfactory substitute was found in a resistance-capacitance transitron arrangement. Coupled with the use of miniature valves and tuning capacitor no difficulty is found in housing the unit in the aforementioned sized box.

The power supply is not included with the oscillators as it is considered more economical to use a separate power unit and operate various items of test apparatus from a common source having several output sockets.

For the oscillators a Brimar 12AT7 valve is used, operated at 6.3 volts l.t. and about 80 to 90 volts h.t. The tuning capacitors C_1 and C_2 are the two sections of an Eddystone miniature ceramic insulated "Microdenser" of 25 + 25 pF. This capacitor measures $1\frac{3}{8} \times 1\frac{3}{8}$ in square and $1\frac{1}{2}$ in deep and fits in well with the general scheme. The only disadvantage is that the capacitance is rather small for some purposes; for example, one 25-pF section will not quite cover the whole television band, generally taken as 40 to 70 Mc/s for test equipment, and the most that can be expected is 40 to 60 Mc/s or 47 to 70 Mc/s, whichever part of the band happens to be the more useful.

A miniature valve is used also for the modulator, in this case a Brimar 6BA6 which has a B7G base. The

Fig. 5. Details of the coil assemblies $L_1 L_3$ and $L_2 L_4$ for a 100-Mc/s v.h.f. range and a 10-Mc/s i.f. range. Harawood formers of $\frac{1}{4}$in dia shellacked before and after winding can be used in place of Paxoline tubes.



12AT7, by the way, has a B9A base now sometimes called a "Noval."

The full circuit of the modulated oscillator is given in Fig. 4 and a few details of the two coil assemblies, L_1 and L_2 for a v.h.f. coverage of 70-110 Mc/s and L_3 and L_4 for an i.f. coverage of 8-11 Mc/s in Fig. 5.

Calibrating an oscillator of this kind needs care and no little patience; while harmonics of crystal-controlled oscillators will give a reliable and accurate calibration it is not always easy to identify them accurately. When it is remembered that a crystal-controlled oscillator will generate usable harmonics up to the 100th or more this difficulty becomes understandable. Moreover, not only do harmonics of the crystal oscillator produce beats with the fundamental frequencies of the variable oscillators, but they can produce beats also with harmonics of the variable oscillators. These possibilities have to be watched carefully and it is essential therefore to have some other means of checking the frequency, even though the alternative aid is approximately accurate only. Its accuracy need be no more than sufficient to differentiate between any two adjacent harmonics of the crystal-controlled oscillator.

A short wave receiver, or the short wave range in a broadcast receiver, will generally suffice for the i.f. range, but the v.h.f. range cannot be quite so easily dealt with. If it happens to be the television band no great difficulty will be experienced as at least two fixed points can always be found if a television set is available. If not, a simple converter must be made up which will receive, in conjunction with any handy existing set, the nearest television station.

This could also be done in the case of the 100-Mc/s range within about 50 to 60 miles of Wrotham, Kent, and two fixed points will again be available. These should enable the crystal oscillator's harmonics in this region to be located and identified. A crystal of about 1.5 to 2 Mc/s will be quite useful for calibrating and if one of 500 kc/s is available also, so much the better.

A useful aid, and one which prevents any ambiguity in identifying the crystal oscillator's harmonics, not directly but via the variable oscillator, is an absorption wavemeter. The Eddystone model has been found particularly useful for these purposes as its upper limit is 160 Mc/s. An absorption wavemeter is the only device of its kind, in a simple form, that does not respond to harmonics of an oscillator direct, but registers only on its fundamental frequency. Therefore, when endeavouring to identify harmonics of the crystal oscillator the harmonic must first be made to beat with the fundamental of the variable oscillator and the frequency of the latter checked against the absorption wavemeter. Response to harmonics is possible with fairly strong oscillators and transmitters but here we are concerned with low-power stages only.

BUS-BELL INTERFERENCE

AS is well known, the electro-magnetic system of a bell or buzzer functions as a surprisingly effective transmitter when deliberately connected to an aerial. It also acts as a producer of heavy interference when it happens that the associated wiring acts fortuitously as a good radiator. Oscillations are produced by the discharge across the contact points of the very considerable voltage built up across the magnet winding, and are transferred to the external wiring.

It appears that conditions for strong radiation often exist on motor omnibuses and trolley buses, where serious interference with television reception is caused by the familiar stop-start bell.

According to A. P. Hale, of Belling and Lee, the suppression of bus-bell interference is not particularly difficult, but no one kind of treatment is necessarily suitable for all cases. The methods advocated are:—

(a) Isolation of the bell from its external radiating wiring by r.f. chokes.

(b) Removal of the higher harmonics by connecting a capacitor across the contact points.

(c) Prevention of undue rise in voltage across the magnet winding.

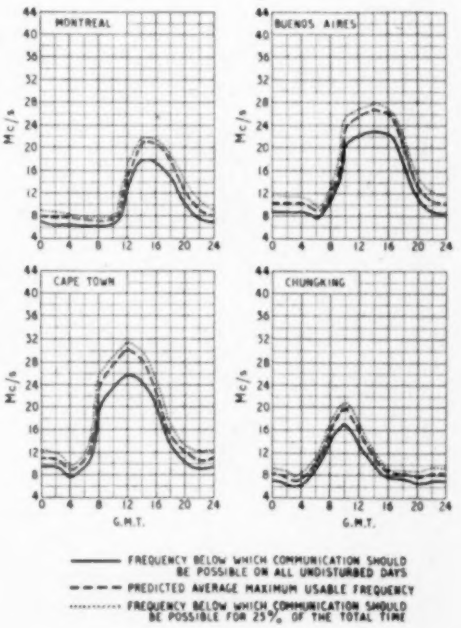
The last-mentioned method is stated to be generally the most effective and also the simplest and cheapest. A non-inductive paper-dielectric capacitor of 1 or 2μF is merely connected across the magnet winding by means of the shortest possible leads. A word of warning is, however, necessary when a high-note buzzer is used instead of a bell; too high a value of shunt capacitance may unduly lower the note.

Short-wave Conditions

Predictions for December

THE full-line curves given here indicate the highest frequencies likely to be usable at any time of the day or night for reliable communications over four long-distance paths from this country during December.

Broken-line curves give the highest frequencies that will sustain a partial service throughout the same period.


MONTREAL
BUENOS AIRES
CAPE TOWN
CHUNGKING
Mc/s
G.M.T.
FREQUENCY BELOW WHICH COMMUNICATION SHOULD BE POSSIBLE ON ALL UNDISTURBED DAYS
PREDICTED AVERAGE MAXIMUM USABLE FREQUENCY
FREQUENCY BELOW WHICH COMMUNICATION SHOULD BE POSSIBLE FOR 25% OF THE TOTAL TIME

Control desk for the low-level modulation transmitter at Kirk O'Shotts.

Low-Level Modulation

Greater Efficiency from High-power Television Transmitters

WHEN the Wenvoe television station begins to radiate its full 50 kilowatts of vision signal some time towards the end of this year, the B.B.C. will have completed its plan for giving us four new high-power television transmitters. Superficially these transmitters all look alike, and, indeed, one might assume from the way they have sprung up within a year or so of each other that they are all of the same standardized design. Actually, they represent quite an interesting schism in the technical world—the old controversy of high-level modulation versus low-level modulation. Sutton Coldfield and Holme Moss use the first kind, while Kirk O'Shotts and Wenvoe have the second, so there is quite an effective "balance of power," if not in terms of actual kilowatts.

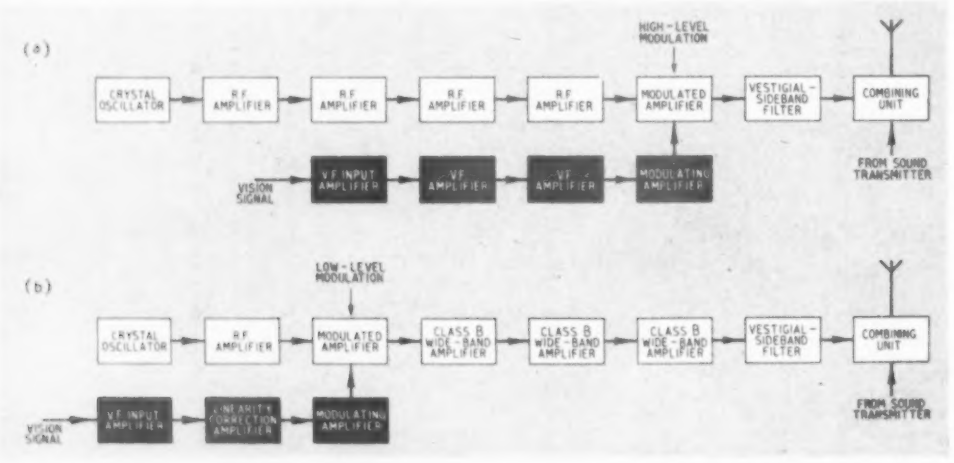
It may be that the B.B.C., with typical impartiality, arranged this state of affairs deliberately, but more likely it came about accidentally: at the beginning high-level modulation was the only thing possible, then subsequent technical developments made it seem that low-level modulation might be better. At any rate both systems are now equally represented, and the B.B.C. is regarding the situation as a kind of competition between them—rather like the competition between a.m. and f.m. that was staged at Wrotham.

When the Carrier Carries

The terms "low-level" and "high-level" modulation probably do not mean very much to the average radio man. They really refer to the particular level of carrier in the transmitter's chain of r.f. amplifiers at which the modulating signal is introduced. At Sutton Coldfield and Holme Moss, for example, Fig. 1(a), the modulating vision signal is introduced at the very highest level possible—at the output stage in fact—whereas at Kirk O'Shotts and Wenvoe (b) it goes in at low level soon after the crystal oscillator.

This means that in (a) the vision signal has to be amplified up to considerable power before it can

Fig. 1. Simplified block diagrams of (a) the high-level modulation transmitters at Sutton Coldfield and Holme Moss, and (b) the low-level transmitter used at Kirk O'Shotts and Wenvoe.



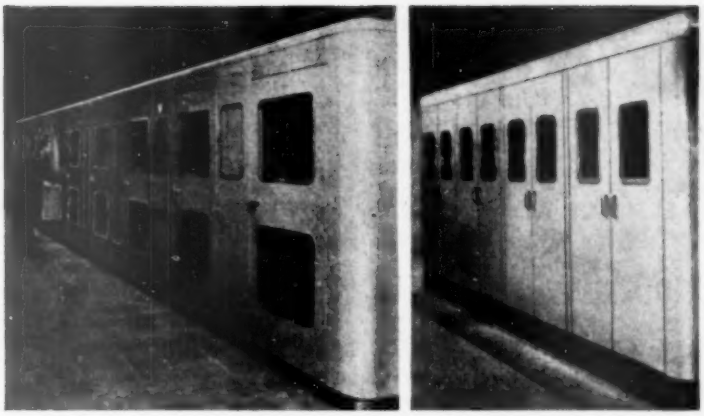


Fig. 2. Showing the difference in size between the vision transmitters at Sutton Coldfield (left) and Kirk O'Shotts (right).

modulate the transmitter and a chain of increasingly large valves is necessary; whereas in (b) very little power is needed for modulating the transmitter at the low-level point and receiving-type valves can be used. And, of course, the power supplies needed for the modulating chain in (a) are very much bigger—electrically and physically—than those for the receiving-type valves in (b). Consequently the transmitter with high-level modulation is necessarily a somewhat larger and more expensive affair than the one with low-level modulation. What the actual difference in size amounts to can be seen from the comparison of the Sutton Coldfield and Kirk O'Shotts vision transmitters in Fig. 2. Kirk O'Shotts, with the considerably greater output power, is only a little over half the size of Sutton Coldfield.

Another significant thing to note from Fig. 1 is that in the high-level system the main chain of r.f. amplifiers only has to amplify a fixed unmodulated carrier frequency, whereas in the low-level system it has to deal with a modulated carrier and sidebands—in fact a band of frequency several megacycles wide. This means that the amplifiers in (b), which are Class B, incidentally, have to be not only linear but wide-band amplifiers—a requirement that involves quite a number of problems in design, construction and maintenance. The chief trouble seems to be in lining up the inter-valve couplings and eliminating various resonances and selective feedback circuits which affect the response at sideband frequencies. For this reason the low-level system has acquired a reputation for being somewhat critical in adjustment—but it has other advantages to set against this.

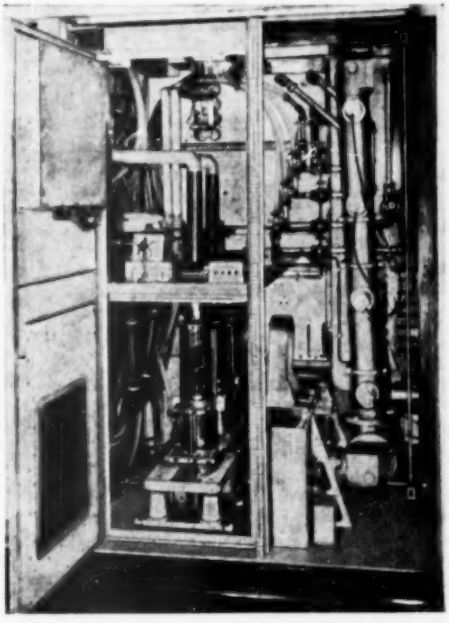
The Electricity Bill

Perhaps the most important advantage is its greater efficiency as a machine for converting raw electricity into radiated power. The transmitters at Kirk O'Shotts and Wenvoe, for example, only require 2 kW from the mains supply for every kilowatt of peak-white r.f. power they radiate, but the high-level ones at Sutton Coldfield and Holme Moss need almost 4 kW. To the average radio man, who doesn't have to worry much about the amount of electricity his equipment is consuming, this may not seem very important. But to the B.B.C., whose television electricity bill runs into tens of thousands of pounds per annum, it represents a considerable saving in running costs. In fact, it is probably the main reason why low-level modulation was adopted for the later transmitters.

Thus the real advantage of the low-level system is in its lower cost—lower initial cost because of the reduction in size and lower running cost because of the increase in efficiency. Apart from this, the system is more adaptable when it comes to designing transmitters of different output powers—all one has to do is to add or take away a few more wide-band r.f. amplifiers. As for the possible unreliability of the wide-band amplifiers, that may well be balanced by the greater reliability which comes from having fewer high-power valves and fewer high-voltage power supplies.

The two low-level transmitters were built by Electric and Musical Industries, and are identical in design as well as in principle. The modulated amplifier, Fig. 1(b), uses a pair of ACT26 air-cooled

Fig. 3. Output stage of the Kirk O'Shotts vision transmitter, showing the water-cooled BW165 valves (left) and the output feeder (right).



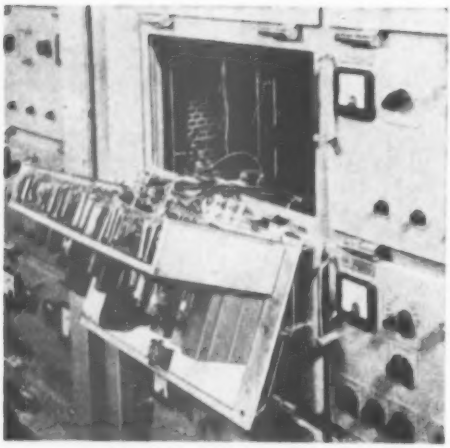


Fig. 4. One of the small amplifiers in the modulating unit at Kirk O'Shotts lowered for inspection.

triodes, which operate in push-pull with earthed grids and give an output of about 600 watts peak white. The three wide-band amplifiers following it are also of the earthed-grid push-pull type. The first uses a pair of ACT27 air-cooled triodes giving an output of 3 kW, the second a pair of ACT26s giving an output of 12 kW, while the third, the output stage, has a pair of BW165 water-cooled triodes giving an output of 70 kW peak white (Fig. 3). The high emission of these BW165 valves, made possible by thoriated-tungsten filaments, is the main reason why Kirk O'Shotts and Wenvoe have a higher output power than the earlier transmitters. In fact, we understand that the output power could be raised to the region 80-100 kW if necessary.

As mentioned above, the modulating amplifier chain uses receiving-type valves throughout (Fig. 4). It consists of a three-stage d.c. amplifier, a linearity correction amplifier, and an amplifier with a cathode-follower output delivering 200 V peak-to-peak to the grids of the modulated amplifier.

At the input of this final video amplifier the black level of the vision signal is finally clamped—and here we have another difficulty associated with low-level modulation. Because this final clamping is done so far away from the transmitter output, there is some danger that the actual transmitter black level will vary as a result of fluctuations in the chain of wide-band r.f. amplifiers. The difficulty is overcome, however, by a feedback system which measures the black level at the output of the transmitter and injects a correcting signal into the vision circuits. This also helps to reduce any mains hum introduced by the wide-band r.f. amplifiers.

The sound transmitters at Kirk O'Shotts and Wenvoe are of conventional design and were built by Standard Telephones & Cables. Modulation is applied at the anodes of both the penultimate and final r.f. stages. The transmitters use air-cooled valves throughout and have an output of 18 kW at 100 per cent modulation.

TELEVISION BOOSTER STATION

Fringe Area Repeater

INEXPENSIVE equipment providing the means for extending the range of a television transmitter into fringe areas has been developed by E. K. Cole Ltd., and used experimentally under G.P.O. licence for the past few months in Essex. Intended for installation at a vantage point in the area to be served, the equipment retransmits the received sound and vision signals on different frequencies, and with a change of polarization, providing a first-class service over an area of approximately 150 sq miles. The change of frequency—to that of a distant station—and of polarization allows direct reception of the original transmission to be continued in the locality without interference. The experimental station, which is installed at the Water Tower, Hadleigh, operates in the Kirk o' Shotts channel.

The equipment at the booster station is housed in a 4ft high rack containing a pair of high-gain receivers, frequency-changer units, low-level amplifiers and sound and vision transmitters.

It is claimed that the quality of the retransmitted signals suffers no appreciable deterioration in the process. Although the experimental equipment operates on 405 lines it can, of course, be adapted to operate on other transmitting standards.

In the top section of the 4-ft rack is the vision transmitter below which is the sound and vision input and frequency conversion units followed by the sound transmitter and the power unit.

STEREOPHONIC AMPLIFIER

THE Stereophonic amplifier Mk. VII according to users gives the highest quality of any reproducer so far produced. This high quality is to be expected when the particular points are considered.

The large reduction of intermodulation distortion and Dopler effect is achieved by completely separate amplifier channels for the high and low frequencies terminating in separate speakers. The latter may be separated by any convenient distance to prevent pressure wave modulation and it is unnecessary to restrict the bass to prevent marring treble.

In each case the speaker is damped by a minimum of 12 times at audible frequencies to prevent speaker resonance, and the cross-over is very fast, approximately 28 db for the first octave. A control is provided to vary the power applied to the treble speaker, to compensate for its efficiency compared with the bass speaker and a frequency record reveals the absence of dip or rise in output at crossover frequencies.

The treble control gives 20 db lift or 14 db cut from 3,000 cycles and compensates for long playing records and various American and English recording characteristics.

The small improvements in the latest model amplifier result in reproduction which is extremely good and capable of pleasing all tastes.

3-WAY MIXER & peak programme meter

for recording and large sound installations etc.

One milliwatt output on 600 ohm line (.775 V) for an input of 30 microvolts on 7.5—30 ohm balanced input. Output balanced or unbalanced by internal switch. The meter reading is obtained by a valve voltmeter with 1 second time constant, which reads programme level, and responds to transient peaks.
Calibration in 2 db steps, to plus 12 db and minus 20 db referred to zero level. Special low field internal power packs supplies 8 valves including stabilising and selenium rectifier, consumption 23 watts.

Manufactured by:

VORTEXION LIMITED

257–263, THE BROADWAY, WIMBLEDON, LONDON, S.W.19

Phones: LIBERTY 2814 & 6242-3. *Grams: "VORTEXION, WIMBLE, LONDON."*

GAS-TIGHT HYPERLOY A.F. TRANSFORMERS AND CHOKES

The widely-used HYPERLOY range of over 100 Specifications is now available in **hermetically-sealed** containers, capable of withstanding the most rigorous climatic conditions.

WEARITE

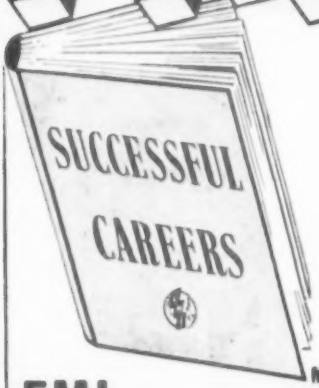
Also available in similar Gas-tight containers, a series of **bi-limboid** Transformers having balanced hum-cancelling windings for use in situations demanding the lowest hum-levels without recourse to expensive mumetal screens.

WRIGHT & WEARIE LTD 138 SLOANE STREET LONDON, S.W.1. SLOane 2214-5

FREE

THIS VALUABLE BOOK

which details the wide range of Engineering and Commercial courses of modern training offered by E.M.I. Institutes — *the only Postal College which is part of a world-wide Industrial Organisation.*



Courses include training for :

City and Guilds Grouped Certificates in Telecommunications; A.M. Brit. I.R.E. Examination, Radio Amateur's Licence, Radio & Television Servicing Certificates, General Radio and Television Courses, Radar, Sound Recording, etc. Also Courses in all other branches of Engineering.

EMI INSTITUTES *associated with* **MARCONIPHONE COLUMBIA & H.M.V** (His Master's Voice, etc.)

COURSES FROM **£1** PER MONTH

POST NOW

Please send, without obligation, the above FREE book

E.M.I. Institutes, Dept. 16,
43 Grove Park Road, Chiswick, London, W.4.

Name _____

Address _____

IC108

Electron-Coupled Oscillators

Explaining How They Keep the Frequency Stable

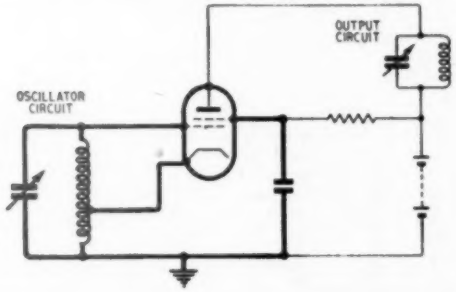
By "CATHODE RAY"

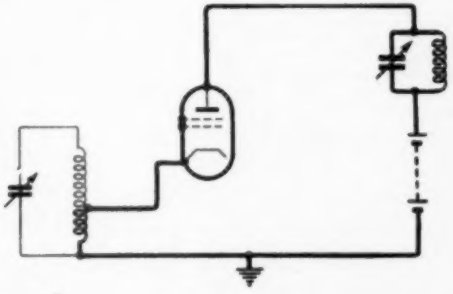
JUDGING from published information, there is a good deal of confusion about electron-coupled oscillators. It seems that some people are under the impression that the characteristic feature of an electron-coupled oscillator is the "live" cathode tapped up the oscillator coil as in Fig. 1. A still commoner impression is that in this type of circuit, with the second grid functioning as the oscillator anode, the coupling to the actual anode is electronic only and does not involve the oscillator tuning circuit. Still another confusion is about the advantage of this type of oscillator. There would probably be agreement that the main object of the arrangement is constancy of frequency, but whereas some would say that the idea is to keep the frequency from being affected by changes in the output (anode) circuit, others would say that it is to keep the frequency from being affected by changes in h.t. voltage. Perhaps most of us are not too clear which particular enemies of constant frequency it is aimed at, or how it combats any or all of them, but have a vague impression that it is the circuit to use when one wants the frequency to stay where it is put.

The origin of the electron-coupled oscillator is generally traced to a paper by J. B. Dow in *Proceedings of the Institute of Radio Engineers*, December, 1931. So it is interesting to note that the Fig. 1 cathode tapping is not to be seen in any of the circuits in that paper. Not all oscillator circuits with this feature are electron-coupled, and not all electron-coupled oscillator circuits have this feature. That is one fallacy disposed of. Next, Dow described how this class of circuit can be made to keep the frequency constant against variations in h.t. voltage, and also against variations in output circuit; but some of the electron-coupled circuits used now—and particularly pentode circuits—cannot achieve both of these advantages at once. Then most of those who explain that in electron-coupled oscillators the anode is coupled to the oscillator only through the electron stream passing through the second grid illustrate their remarks with a circuit of the Fig. 1 type. They seem not to have noticed that to get back to the cathode this same electron stream has to pass through the output circuit and part of the oscillator circuit in series, as shown more clearly in Fig. 2. Is one therefore safe in assuming that nothing one does with the output circuit can affect the oscillator circuit?

Let us begin at the beginning and assume we want a stable-frequency oscillator that we can do things with; it may be a master oscillator for a transmitter, or a signal source for making tests. Obviously we will shut up the tuning circuit in a metal screening box to prevent it from being influenced by the movements of hands and other objects around. But if the oscillations are to be used in any way there must be some connection with the outer world. This connection must be strictly one-way; nothing that happens in the outer world must be allowed to change any capacitance or inductance forming (intentionally or otherwise) any part of the oscillator tuning circuit. So inductive or capacitive coupling is definitely out. The obvious one-way link is a valve. Just any valve won't do, of course; a triode has quite enough capacitance between anode and grid for adjustments in the anode circuit to alter the total capacitance of the grid circuit. A screened valve stage, such as is used for r.f. amplification, is all right. Because the primary purpose of this one-way stage is to protect the oscillator from the influence of the output circuit rather than to amplify it is called a buffer stage.

The thrifty experimenter, always on the lookout for





Left: Fig. 1. One variety ("live cathode") of electron-coupled oscillator. In this and the diagrams of other varieties (Figs 3 and 4) the oscillator part of the circuit is emphasized, and only the bare essentials are shown. Right: Fig. 2. The output part of Fig. 1 emphasized, to show how it includes part of the oscillator tuning circuit.

opportunities to make one valve do the work of two, naturally grudges a whole valve merely as a buffer. Dow pointed out that by taking appropriate precautions a single valve can be made to combine the duties of oscillator and buffer stage. The ordinary oscillator circuit won't do, because both input and output (grid and anode) are parts of the oscillator system, so anything attached at the anode end is more than likely to shift the frequency. Dow's scheme, which is the basis of electron-coupled oscillators, is to use another grid as the oscillator anode. What is actually called the anode need not then form part of the oscillator circuit, yet the current through it is varied at oscillatory frequency by the other electrodes. Provided that the valve is of such a kind that changes in anode potential don't affect current in the electrodes used for the oscillator, and that the anode can be screened off from the oscillator, it is suitable. The oscillator is connected in a one-way manner to the output circuit by the stream of electrons through the valve, much as a policeman can connect himself in a one-way manner to a rioter by a stream of water from the fire hose he is holding. Anything the rioter does with the water at his end has no effect on the policeman.

Use of a Tetrode

Dow used a tetrode, with the cathode and the two grids as a conventional earthed-cathode triode oscillator, and took the output from the anode (Fig. 3). Since the second grid in this arrangement is at oscillating potential, the capacitance between it and anode would have spoilt the system by its two-way action if Dow hadn't balanced it out by neutralization. This is a technique that was much used in the 'twenties, before screened valves had superseded it, to overcome back-coupling through anode-to-grid capacitance. Most of the present generation of radio enthusiasts may not even have heard of it, and since it is obsolete I will not confuse the issue by going into its details —they can be found in the older textbooks. And in any case Dow went on to point out that if a pentode is used, as in Fig. 4, there is no need for neutralization, because the suppressor grid (g_3) is an earthed screen between oscillator "anode" (g_2) and the output anode (a).

Fig. 4 is more convenient to use than Fig. 3 plus neutralization. But it sacrifices an advantage obtainable with Fig. 3. For reasons that are rather too involved to turn aside to examine here, the frequency of oscillation is slightly affected by the h.t. voltage. In a tetrode it is shifted one way by an increase in anode voltage and the opposite way by an increase in g_2 voltage. If the same increase is applied to both, the g_2 effect overbalances the a effect, but by feeding g_2 from an adjustable potential divider across the h.t. supply the two effects can be equalized so that they cancel out, and this setting holds good at least approximately over a reasonable range of h.t. voltage fluctuation. This may save the cost of a voltage stabilizer, which is even more worth while than using an electron-coupled oscillator instead of a separate buffer stage. Unfortunately, a balance point is not obtainable with the pentode oscillator.

I hope I have managed to make these two quite different frequency-stabilizing devices clear. Using a circuit of the Fig. 3 type, elaborated by a pre-set potential divider across the h.t. source for g_2 supply, one can stabilize the oscillator frequency against h.t. voltage fluctuations; but it is not a pure electron-coupled oscillator as it stands, because there is coupling back from output to oscillator circuit via the g_2-a capacitance. Dow got over this by neutralization, which necessitates another and far more tricky pre-set adjustment, so is not popular. His alternative type, Fig. 4, is very good as an electron-coupled system protecting the frequency of oscillation from anything that may be done in the output department, but not to the fullest extent from variation in h.t. voltage.

Output Circuit Variations

Since then the earthed-g_3 (Fig. 1) type has appeared. (The capacitance between g_2 and earth is made large enough to offer negligible impedance at the frequency of oscillation.) When used with a tetrode, as here, it offers the advantage of stabilization against h.t. variations, if a potential divider is substituted for the series resistor feeding g_2. But what about variations in output circuit, caused, say, by tuning or other adjustments? Currents at oscillation frequency are flowing there, and they set up corresponding voltages at the anode, their amplitude and phase depending on the amount and nature of the output circuit impedance. Since g_2 is firmly tied to earth it cannot be affected by these voltages through inter-electrode capacitance. And for the same reason it acts as a screen for g_1 and the cathode, so all points of the oscillator circuit are protected. Valve characteristic curves show, however, that g_2 current is determined to some extent by anode voltage, so presumably the g_2 oscillatory current in this oscillator will be determined to some extent by the nature of the output circuit. But in a tetrode it

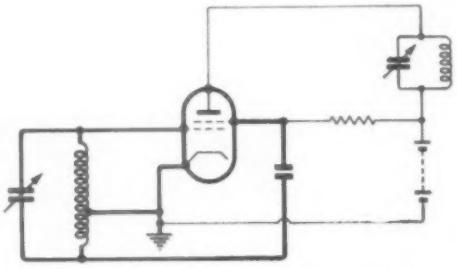


Fig. 3. Dow's original earthed-cathode tetrode electron-coupled oscillator circuit, drawn for comparison with Fig. 1, and omitting the necessary capacitance neutralization.

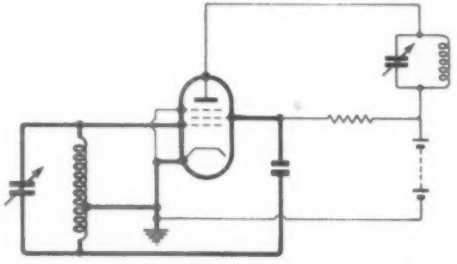


Fig. 4. Pentode variety of Dow's electron-coupled oscillator, needing no neutralization.

is a very small extent, and in a pentode it is a smaller extent still, so a pentode is usually preferred to a tetrode in Fig. 1. Incidentally, it gives better capacitance screening too, or alternatively permits the earthed-cathode arrangement of Fig. 4, but at the sacrifice of h.t. voltage compensation as we have just seen.

Lastly, if the oscillating-cathode (Fig. 1) arrangement is adopted, what about the scare I raised at the start—about the output circuit and the lower part of the oscillator tuning circuit being in series (Fig. 2), so that adjustments of one affect the other? Well, theoretically at least, this can cause unwanted frequency variations. The oscillator current produced in the anode circuit has to get back to the cathode, and in this arrangement it undoubtedly can only do so by passing through part of the oscillator tuning circuit. As already mentioned, the amplitude and phase of this current depends on the output circuit impedance. In particular, tuning it through resonance swings the phase rapidly from leading to lagging, or vice versa. Now if a leading current is added to the normal current in the oscillator tuning circuit, it is equivalent to adding capacitance to that circuit; and a lagging current is equivalent to inductance. (This is the basis of the "reactance valve" in automatic tuning correction systems.) So one would expect to find that the frequency of oscillation would vary as the output circuit tuning was adjusted in the neighbourhood of resonance. Since this danger is not mentioned in the books that deal with electron-coupled oscillators I thought I had better check it by experiment before saying too much about it.

Measuring Frequency Disturbance

I used the circuit shown in Fig. 5 (a), tuned to oscillate at a nominal 1 Mc/s, so that frequency fluctuations in c/s would also be parts in 10^6, which is the usual basis for comparing them. Actually it was tuned to give an audible beat with the carrier wave of Hilversum (1.007 Mc/s) which presumably could be relied upon to stay constant within about 1 c/s. This audible beat was compared with a calibrated audio oscillator, so that any changes in it could be measured fairly accurately. The output circuit was made a little less lively by the 25-kΩ shunt, because preliminary tests had shown that without it the tuning of the output circuit caused very noticeable frequency disturbance even with the arrangement as shown (earthed cathode). It had been checked that this disturbance was not by direct coupling of the circuits but must be through the valve. The 100-turn oscillator coil was tapped for the cathode 20 turns from one end, and tests were made with that end connected in turn to g_1 and to g_2. These two tests were repeated with the earth transferred to g_2, as in Fig. 5 (b). The frequency disturbance caused by swinging the output circuit through resonance was noted for each of these four conditions; and also the disturbance caused by varying the h.t. voltage from 180 to 240. The results are shown in the table.

I must emphasize that with an experiment like this one has to be careful not to jump to too many conclusions. The thing being measured is at most a small fraction of 1 per cent, and is liable to be affected by incidental consequences of the circuit changes made. For instance, I suspect that some of these effects may have tended to balance one another out, and the extent to which they did so might depend a good deal on the precise details and arrangement of the circuit, type

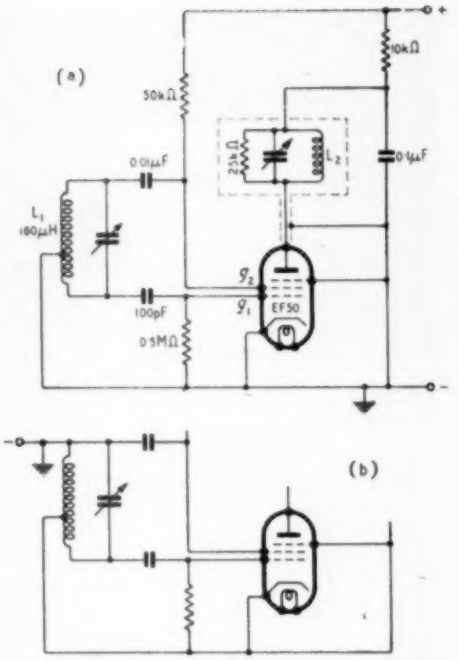


Fig. 5. Test circuit used in the experiments described. (a) is the earthed-cathode variety, and (b) the live-cathode modification.

Connections of L_1	Frequency disturbance, in c/s or parts in 10^6, due to :	
	Tuning anode through resonance	Shifting h.t. from 180 V to 240 V
(1) Cathode earthed and near g_1 end ..	600	90
(2) Cathode earthed and near g_2 end ..	140	15
(3) g_2 end earthed and near cathode tap ..	100	110
(4) g_2 end earthed; cathode tap near g_1 end	610	110

of valve, and so forth. The very good stability against h.t. voltage in arrangement (2) might be a case in point.

So, with this warning to have a pinch of salt handy, here is my theory to account for the figures in the middle column. The most noticeable feature is the relatively high frequency shift when the cathode tap is near the g_1 end. The fact that in this case the biasing back of the grid is less, and oscillation is fiercer, may have something to do with it; but I suspect the main factor is that the g_2 current has to go through a larger part of L_1 to get back to the cathode, so any phase

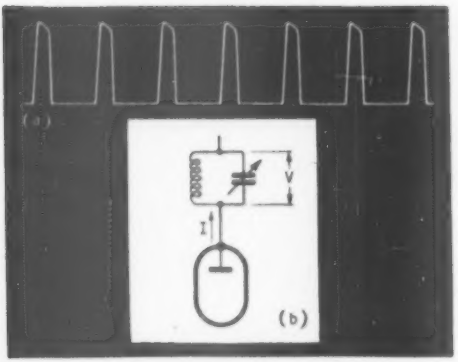


Fig. 6. With such a distorted waveform as (a), representing the anode current I in (b), would one expect V to have a practically pure sine waveform?

shifting of part of this current, due to influence of the anode as already described, has more effect than when the cathode is near the g_1 end. Note that the earthing or otherwise of the cathode doesn't affect this action, so if it is the major action the near-equality of (1) and (4) is not surprising.

The other influence, due to phase shift in the anode current itself passing through part of L_1, seems to be relatively small. In (1) and (2), of course, it would be non-existent. According to my reckoning, the direction of the phase shift should tend to oppose the g_1 current effect; and this is borne out by the smaller frequency shift in (3), where both influences are present at once, than in (2). By the same reckoning, it should be slightly less in (4) than in (1); but as the g_1 effect is so much larger than the anode effect in this case it would probably need a more accurate test to show it up; or, more likely, there is some secondary consequence of the change of connection.

At least one reason why the anode current effect should be relatively small is the very high internal anode resistance of a pentode, which dwarfs the external load impedance. In the test circuit, the valve resistance would be at least 50 times the load impedance at resonance, and of course more than that in relation to *changes* in load impedance caused by tuning it.

Position of Coil Tap

The main fact that seems to emerge is the desirability of keeping the tapping near the g_1 end. Compared with that, the question of whether or not to earth the cathode is unimportant. The very satisfactory figure in the right-hand column of (2) may of course be due to a lucky combination of conditions with the particular oscillator tested, but if it were confirmed for the oscillator one proposed to use I would be inclined to plump for this number, unless the fact that in (3) one terminal of the oscillator tuning capacitor can be earthed weighs heavily in its favour. All the right-hand figures are pretty good, bearing in mind that one would not normally be so pessimistic as to expect the voltage to fluctuate between 180 and 240. As for the apparent advantage of (3) over (2) as regards output tuning, the difference is not very important, and the frequency shift could almost certainly be reduced by shifting the tap still nearer g_1 and abolished altogether by tuning the output to a harmonic of the oscillator frequency instead of the fundamental. (Apart from anything else, this might save still another valve—a frequency multiplier!) For the oscillatory current in the anode circuit is very far from being a pure sine wave, as was seen by short-circuiting L_2 and open-circuiting the 0.1-μF by-pass and using the oscilloscope on the voltage waveform across the 10-kΩ anode decoupling resistor. With the anode tuning circuit restored, the waveform across it was a beautiful sine wave at whatever fundamental or harmonic frequency it was tuned to.

Although it doesn't concern electron-coupled oscillators more than any other kind, this distortion-eliminating effect of a tuned circuit is sufficiently remarkable to be entitled to the little space that is left. Of course, everybody knows that a tuned circuit greatly encourages signals of the particular frequency to which it is tuned, but I doubt whether everybody realizes quite how effectively it gets rid of harmonics in a poor waveform. If you had an oscillator that was grossly overloading, giving anode currents with a waveform such as Fig. 6 (a), for example, would you not expect the output to be just a little distorted, even if taken from across a moderately good tuned circuit (b)? The fact is, however, that even with the grossest distortion in I it is unlikely that there would be more than a fraction of 1 per cent of any harmonic in V. Does that surprise you?

Reduction of Harmonics

It is one of the basic facts about parallel resonant circuits that the oscillatory current surging around between coil and capacitor (which is the current responsible for the voltage across the circuit, V in Fig. 6 (b)) is Q times the current fed in (I in Fig. 6 (b)) at the same (fundamental) frequency. But harmonics are not only not magnified; they are reduced. The reduction factor depends on the number of the harmonic; here are the first few figures, in terms of voltage:

Harmonic	Voltage relative to fundamental
1 (fundamental)	1
2	2/3Q
3	3/8Q
4	4/15Q
5	5/24Q

For example, a medium Q for an r.f. tuned circuit is 100, so the second-harmonic voltage would be only 1/150th of the percentage second harmonic in the anode current. Even if the current were so badly distorted as to have 100 per cent second harmonic, the output voltage would have only 0.67 per cent. A third harmonic of 100 per cent (fearful thought!) would be reduced to 0.375 per cent; and so on. High harmonics are reduced approximately to $1/nQ$, where n is the number of the harmonic.

That is with a straightforward connection, as in Fig. 6 (b). If the tuned circuit is tapped, the calculation is rather more complicated. Anybody who is interested should refer to E. B. Moullin's "Radio Frequency Measurements" (2nd edition), p. 111.

Marconi Television for Venezuela

A Shell Photograph

Equipment for the Caracas Television Station, sponsored by 'Televisa', includes:

- 5 kw vision transmitter
- 3 kw sound transmitter
- Complete mobile O/B television unit, with two camera channels and micro-wave links.
- Associated aerial system
- Complete studio installation

Venezuela is the latest country to install Marconi television.
Marconi cameras are used by the United Nations to televise their Sessions, and the television systems of both Canada and Spain bear the name Marconi.
Marconi transmitters and aerials have been installed in every one of the B.B.C.'s five television stations.

MARCONI

television transmitting equipment

MARCONI'S WIRELESS TELEGRAPH CO., LTD · CHELMSFORD · ESSEX · ENGLAND

This London Office Business . . . . .

FOR a number of years we have run a London Office and enjoyed the patronage of many good friends and Quality enthusiasts but we have always been aware that such an arrangement has one serious snag ; namely, that people are not in the position to judge instantly the superiority of *Sound Sales'* products by direct comparison and furthermore they are not always able to hear Sound Sales' amplifiers perform on various and different makes of speakers.

Therefore, we think we could serve you better by arranging for all our products to be available for demonstration and sale where direct comparison can be made with other makes, and accordingly we are pleased to announce that . . . .

Messrs. WEBB'S RADIO, 14, Soho Street, Oxford Street, London, W.1. *Tel: Gerrard 2089*

WILL DEMONSTRATE AND SELL ALL OUR WELL KNOWN PRODUCTS INCLUDING A-Z AMPLIFIERS, RADIO FEEDER UNITS, P.I. SPEAKERS, SCRATCH FILTER CHOKES, ETC., ETC.

•

THE MINIATURE A-Z AMPLIFIER. It is appropriate to announce the introduction of the Miniature A-Z. A small, qual ty amplifier with tone control and volume control, plus switching for 78, Standard, 78 ffrr, and Long Playing records. *Price* £10 15*s*. 0*d*. The amplifier is designed especially for those who require a gramophone amplifier for the reproduction of their favourite records and do not require full power of our famous A-Z amplifier, due to lack of space.

SOUND SALES LIMITED., · WEST STREET, FARNHAM, · SURREY

Telephone : Farnham 6461/2/3.

THE WESTON E772 Super Sensitive Analyser

No 10. **Multi-Range Testing Instruments**

Best known of all instruments for the testing and servicing of radio and television equipment is undoubtedly the Weston Model E.772 Analyser, a first-class portable instrument with a sensitivity of 20,000 ohms per volt on all D.C. ranges and 1,000 ohms per volt on all A.C. ranges. The additional features of wide range coverage, robust construction and simplicity in operation contribute toward making the E.772 ideal also for laboratory and research work. Full details of this instrument and also of the Model S.75 a Test Set covering 53 ranges will gladly be supplied on request.

SANGAMO WESTON LIMITED · ENFIELD, MIDDLESEX

TELEPHONE: ENFIELD 3434 (6 lines) and 1242 (4 lines). GRAMS: SANWEST, ENFIELD

Branches: London Office: St Georges Court, New Oxford Street, W.C.1. Telephone: CHAncery 4971.

GLASGOW	MANCHESTER	NEWCASTLE	LEEDS	LIVERPOOL	WOLVERHAMPTON	NOTTINGHAM	BRISTOL	SOUTHAMPTON	BRIGHTON
Central	Central	Newcastle	Leeds	Central	Wolverhampton	Nottingham	Bristol	Southampton	Brighton
6208	7934	26867	30867	0230	21912	42403	21781	3328	28497

V.H.F. RADIO

Review of the Various Systems at Present in Use

By E. G. HAMER, B.Sc.(Eng.), Hons.*

DURING the last five years, frequencies in the 70-500 Mc/s range have been used increasingly for fixed and mobile communications and for links in mixed line and radio services. One of the main reasons for this is the overcrowding of the h.f. bands, while an advantage is the restricted maximum range of the very high frequencies under normal propagation conditions. It is thus possible to have radio systems on the same frequency a few hundred miles apart, geographical separation being sufficient to avoid mutual interference. The extreme range of v.h.f. systems is usually 30-70 miles, depending on the frequency, the transmitted power, and the location of the transmitting and receiving aerials. Propagation is usually line-of-sight, but at the lower frequencies considerably greater ranges may be obtained owing to diffraction effects. Over short ranges, considerable reflection also takes place, so that v.h.f. is particularly suitable for mobile communications.

Typical users of mobile v.h.f. radio services are police, ambulance and fire services, aircraft, shipping domestic and "business radio." The fixed services are usually broadcast, or the radio equipment may be designed to operate with multi-channel equipment and forms part of trunk telephone or teleprinter networks.

The 1947 International Telegraph Union conference held in Atlantic City, U.S.A., discussed the allocation of frequencies in the v.h.f. and u.h.f. regions. Certain recommendations were made regarding the use of various frequencies in different parts of the world, but their exact interpretation rests with the appropriate authorities in individual countries.

Table I shows the Atlantic City recommendations for the use of frequencies in the region 70-585 Mc/s. Although there would appear to be plenty of channels available, in fact the lower frequency bands are now almost fully occupied. In this country this is partly because the Post Office have endeavoured to allocate each individual service a separate channel free from interference by other users. Owing to the very large number of users in the United States, many have to share a common channel.

The various users and services have here been classified into two groups: (a) mobile services, and (b) static services including broadcast and multi-channel systems. V.h.f. broadcast services have recently been described[1, 2] and will not be elaborated further. Many techniques are common to several types of schemes, although equipment for multi-channel working is usually of more elaborate design, much greater bandwidth, and higher cost.

For the majority of mobile installations there is the choice of frequency and type of modulation, and various arguments have been advanced as to the relative merits of one type of modulation over another. For single fixed station schemes, however, the small theoretical differences are completely overshadowed by such factors as the reliability of the equipment, the degradation of performance with time and vibration, the valves used, the effects of spurious outputs and responses, and the susceptibility of the receiver to blocking and cross-modulation. Comparative tests are misleading if different types of equipment, such as one set being several years older than the other, are used. If identical equipments are used as far as possible, the basic design is nearly always more suitable for one type of modulation, particularly in regard to the radio frequency bandwidth. Usually the f.m. receiver will have a smaller radio frequency bandwidth than the a.m. receiver which has a comparable performance when subjected to impulse noise. This apparent anomaly is caused by the type of noise-limiting circuits used in the a.m. receiver. They are operated by pulses of noise, and the shape of these

TABLE I

Atlantic City and F.C.C. Recommendations for use of Radio Frequencies, 1947

Band of frequencies, in Mc/s	Use in England	Use in U.S.A.
72–76	Fixed and mobile services	Fixed service
76–88	Broadcast, fixed and mobile services	Television
88–100	Broadcast	F.M. Broadcast
100–108	Broadcast	
108–118	Aeronautical radio-navigation	Aeronautical radio-navigation
118–132	Aeronautical mobile	Aeronautical mobile
132–144	Fixed and mobile services	Aeronautical mobile
144–146	Amateur	Amateur
146–148	Amateur	Amateur
148–174	Fixed and mobile services	Public mobile services
174–216	Broadcast, fixed and mobile services	Television
216–220	Fixed and mobile services	Television
220–225	Amateur	Amateur
420–450	Aeronautical radio-navigation and amateur	Amateur
450–460	Aeronautical radio-navigation, fixed and mobile services	Public and broadcast services
460–470	Fixed and mobile services	"Citizens radio"
470–585	Broadcast	Broadcast

* G.E.C. Research Laboratories, Wembley.

[1] "V.H.F. Broadcasting," *Wireless World*, January 1952, pp. 10-11.

[2] "F.M. in Germany," *Wireless World*, April 1952, pp. 141-144.

pulses must be maintained up to the receiver detector and noise-limiter circuits. If the a.m. receiver were made a narrow bandwidth, the peaks of impulse noise would be rounded off and reduced in magnitude, and the limiter circuits would be ineffective.

The choice of type of modulation will largely depend upon the particular manufacturer's preference, any regulations laid down by the licensing authority, and the desire to standardize different schemes. It may also be influenced by the availability of suitable low-priced test equipment. Frequency modulation is nearly always used in the U.S.A., and amplitude modulation in England.

Most mobile schemes are operated in simplex (i.e., one station transmits at a time) and this reduces the power drain at the mobile station and the necessity for having two aerials or elaborate aerial filters. Two separate frequencies are necessary for duplex working, while a single frequency only can be used for simplex working. Single frequency simplex would appear to be advantageous for car-to-car working, but the range is usually restricted to 1 to 5 miles, depending upon locality. Double frequency simplex can increase the range of car-to-car working to the full system range, since the fixed station acts as a repeater when the output of its receiver is coupled to the input of its transmitter. This system has the advantage that the fixed station operator has overriding control and can break in with an urgent message to all mobiles except that actually transmitting.

Fig. 1 is a block schematic diagram of a double frequency simplex scheme, using a single fixed station and arranged for car-to-car working. Either amplitude or frequency modulation may be used. Double frequency simplex might appear more wasteful of radio frequencies than single frequency simplex but, where many systems are in use, a saving is obtained since schemes using the same frequencies can be more closely spaced geographically. The main high-power fixed station transmitter of one scheme, sited on a hill, will not interfere with the signal received from a mobile station at the fixed station receiver of adjacent schemes, although this might occur if adjacent schemes were using single frequency simplex on the same frequency.

Fixed Station Requirements

There are several variations of these simple mobile schemes, for example additional radio channels may be used to connect the fixed station sited on a hill to the operational control centre; or land lines may be used for the purpose, and the fixed station be unattended, all switching being done from the control centre. For any given town or area, the number of suitable station sites is limited and several fixed stations on different frequencies may use the same site. Extra aerial filters and specially designed receivers may be necessary to prevent a high-power transmitter blocking a nearby receiver. Several 100-watt transmitters may be radiating only a few yards away from a receiver with a sensitivity of 0.5 μV, and on a frequency differing by, say, 10 per cent.

Considerable trouble may be experienced due to blocking and cross-modulation from one transmitter, or from several transmitters, causing intermodulation products to be radiated from any non-linear circuit in close proximity. These non-linear circuits may occur at any metallic junction, particularly between dissimilar metals. This "rusty bolt" effect cannot usually be removed by the use of aerial filters since some of the intermodulation products may lie inside the pass band of the receiver. These possible troubles are additional to those caused by spurious outputs from the transmitters, and spurious responses of the receivers. Many of the defects due to spurious responses, blocking and cross-modulation have been eliminated in modern receivers, but the remedies are expensive and do not constitute an immediate improvement unless older type receivers have been tried and found unworkable.

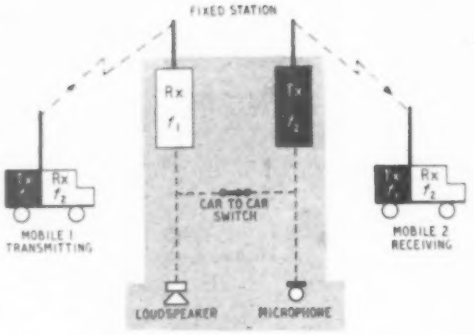


Fig. 1. Double frequency simplex scheme adapted for car-to-car working.

Mobile Receiver Characteristics

Receivers for use in mobile radio schemes are designed to have the maximum permissible gain, and the performance is limited either by man-made noise at the lower frequencies, or thermal noise at the higher frequencies. To reduce the noise threshold to a minimum, the receiver bandwidth is narrowed as much as possible consistent with the requirements of drift of components, passing the modulation sidebands, and allowing the limiters to cope effectively with impulse noise. The usual receiver r.f. bandwidth varies from 20 to 50 kc/s (being larger at the higher frequencies), with receiver noise factors of 4-8 db at 100 Mc/s to 6-12 db at 200 Mc/s. Present designs give audio-to-noise ratios of 15-20 db for input signals of 2 μV. Subjective intelligibility of the speech at low signal-to-noise ratios is improved by adding post detector filters set to give a rising characteristic from 300 to 1,000 c/s and a sharp cut-off at 3,000 c/s. The exact characteristic must be determined by subjective listening tests and depends on such factors as the background acoustic noise at the location of the microphone.

Muting or squelch circuits are often fitted to the receivers to reduce the amount of noise during the no-signal period. These may be either operated by relays or electronically, and are controlled either by the incoming carrier level or by the amount of noise present with the speech. Transmitter powers vary from 20-100 watts at the fixed stations to 5-15 watts at the mobile stations, the power outputs of the mobile units depending on the operating frequency.

Owing to the use of carbon microphones and small loudspeakers in the mobile units and to the general

nature of the service, it is not practicable to keep harmonic distortion at a very low value. Distortion of the order of 10-15 per cent for speech signals is common. Such services are essentially a means of exchanging information and, except in the case of mobile telephone services, may be operated at the limit of intelligibility. At the extreme edge of the service area, the system will be giving 50 per cent intelligibility, requiring the repetition of parts of the message. Owing to diffraction and reflection of the radio frequencies, a complex pattern of standing waves is set up, and the radio frequency carrier level may vary 10-20 db when the vehicle moves, say, one foot. As a result, a moving vehicle at the edge of the service area may receive a speech signal that has bursts of noise cutting in at a rate dependent on the radio frequency and the speed of the vehicle. For telephone-type services, the receiver muting circuits are set so that there is no receiver audio output unless the audio-to-noise ratio is greater than, say, 30 db.

Where a large number of mobile units is in use, or with telephone-type services, some form of selective calling may be used. Although all the mobile units then receive the audio signals, only the selected unit, or units, is able to hear the message. In certain cases, all the units not hearing the signals have their transmitters locked out to prevent the inadvertent interruption of the return conversation from the other mobile. Two methods are in general use for operating selective calling systems, one uses a series of impulses, and the other combinations of tones. The two systems are very similar in technical performance. The multi-tone system, especially at the mobile station, is more compact and consumes less power. Both systems are found to work on signal-to-noise ratios smaller than can be used for speech, so that there is no restriction on the effective service area. Both systems can be arranged to call either individual mobile units, groups of units, or every mobile unit in the event of certain emergency calls.[5]

Multi-station Schemes

To increase the service area of mobile schemes, systems are now in use where several fixed stations on the same nominal frequency are in use simultaneously. The main problems are the elimination of beat frequencies in the audio frequency speech band, and the distortion which might occur due to multi-path propagation effects.

With a.m., the transmitter frequencies are spaced so as to make the beat notes inaudible. Where many stations are in use, the receiver bandwidth must therefore be increased in order to receive all the signals. Also, owing to the supersonic beats, that part of the spectrum above the speech band cannot be used for signalling or selective calling signals.

Where f.m. is used, the transmitters are all operated either at the same radio frequency, or within 30 c/s of the mean radio frequency. Here the disadvantage is that an additional radio channel is required for synchronizing or closely maintaining a small frequency difference between the various transmitters. With the f.m. scheme there is no limit to the number of fixed station transmitters which may be used. With recent developments in quartz-cutting techniques and improved temperature-controlled ovens, it may become possible for independent transmitters to work on the same nominal frequency using either a.m. or f.m., without causing serious distortion in the equi-signal regions. Both types of system have been adequately dealt with previously[4, 5] and need not be described further.

F.M. or A.M

With double frequency simplex schemes, an elaboration of the scheme as shown in Fig. 1 can be used for car-to-car working. Using a.m., the audio output of the appropriate receiver is used to feed its associated transmitter, all the fixed stations' frequencies being spaced to avoid beat notes. With f.m., a true repeater station may be used, the frequency changing from the incoming to the outgoing frequency without demodulating the signal. The outgoing frequencies are then all nominally the same, the only errors being those due to the shift crystal. This type of station is discussed in more detail later. Fig. 2 shows a block schematic diagram of a double frequency simplex area coverage scheme. The satellite stations S_1, S_2 and S_3 are used as repeaters for both outgoing and incoming calls. Satellite S_1 is located on a hill, giving general coverage, adjacent to it is fixed station S_{1A} having equipment on the same frequencies as the other mobiles. It is really a "fixed" mobile station connected by land line to the main control centre C_1. Stations S_2 and S_3 are installed in important towns, the aerials being sufficiently high for them to be able to work with S_{1A}. In the case of an outgoing signal from C_1, the signal at frequency f_2 from S_{1A} is received and repeated at frequency f_1 by all three satellites. Mobile 1 receives its signal via S_1 or S_3, but mobile 2 can only be reached through S_3. On the return signal, the reverse procedure applies. At satellite S_2 auxiliary control circuits are taken by land line to control centre C_2 which can then contact any mobile in the service area of satellite S_2. In this case C_2 does not operate the

[4] Brinckley, J. R., "A Multi-Carrier V.H.F. Police Radio Scheme," *Jour. Brit. I.R.E.*, 8, No. 3, pp. 128-142, May-June 1948.

[5] Cole, W. P., and Hamer, E. G., "Multi-Station V.H.F. Communications using Frequency Modulation," *Jour. Brit. I.R.E.*, 10, No. 7, pp. 244-258, July 1950.

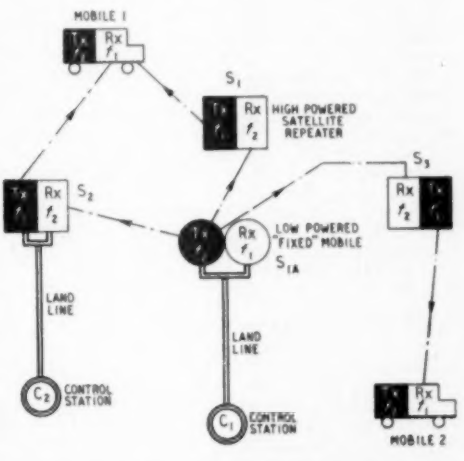


Fig. 2. Double frequency simplex area coverage scheme.

[5] Fairbairn, E. P., "Switching Methods for V.H.F. Networks," *Jour. Brit. I.R.E.*, 11, No. 12, pp. 576-584, December 1951.

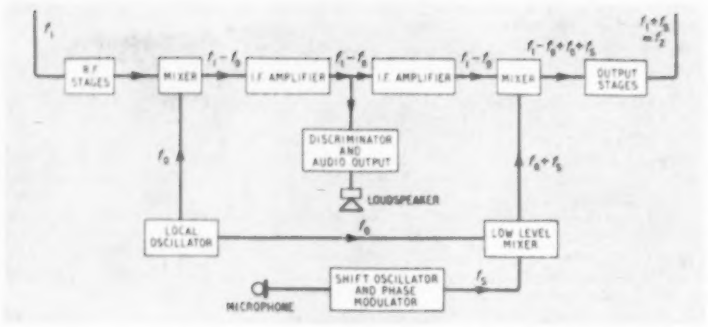


Fig. 3. Non-demodulating repeater station using frequency modulation.

whole scheme and can only use S_1 alone. Where f.m. is used, any number of low-powered satellite stations in various towns may be added, provided they can always work the control satellite S_1. Only one station need be sited on a hill, all other stations can be located in the towns. This is a major advantage over schemes requiring several main stations on high sites, since site development costs form the main cost of any radio scheme. In addition, the same equipment is used for outgoing and incoming circuits, giving reductions in the amount of equipment used and in maintenance charges, and increasing reliability.

Multi-channel Relay Systems

In the v.h.f. range, nearly all multi-channel relay systems use frequency or phase modulation, although simple pulse modulated systems have been tried at the higher frequencies. The use of f.m. is dictated as the distortion and cross-modulation products must be small. The distortion in an f.m. system is mainly due to circuits which have a varying phase characteristic, or time delay with radio frequency; hence valves are excluded. With tuned circuits the distortion can be predicted and the circuit Q values, coupling factors, or resonant frequency, set to give the required distortion figures. The lower the circuit Q the smaller the distortion, but the Q value requires to be as high as possible to achieve a reasonable stage gain, and to give the required selectivity. To a first order approximation, second harmonic distortion is due to circuits being off tune, and third harmonic distortion is due to the phase characteristic, and is decreased by lowering values of circuit Q.

Other major sources of distortion are the modulating and demodulating circuits. Advantage is often taken of the use of f.m. to change the frequency by heterodyne methods at repeater stations, thus avoiding the need for demodulating and remodulating the signal. If a.m. were used, the circuit design becomes very difficult if not impossible. Since the modulation is carried completely through each unit, all valve circuits must be linear and, with a.m., class C amplifiers cannot be used in the transmitter circuits. This would cause a very uneconomic design, since large numbers of class A linear amplifiers would be required to obtain adequate radio frequency power.

Fig. 3 shows a block schematic diagram of a non-demodulating repeater station suitable for frequency-modulated signals, which has facilities for a local engineer's channel. A standard receiver is used, but the i.f. output feeds a transmitter mixing circuit in addition to the local discriminator circuits. At the transmitter mixing circuit, the i.f. is combined with a new oscillator frequency to give the required outgoing frequency. The accuracy of the output frequency is not dependent upon the receiver local oscillator frequency, the only errors being those due to the variation of the shift frequency crystal. Assuming a frequency of 15 Mc/s, a crystal with a temperature coefficient of 2 parts/10^6/degree, and a thermostatic oven with a range of $\pm 1^\circ$ C, the maximum error between the incoming and outgoing frequencies will be ± 30 c/s. The smallness of this error is important where a long chain of repeater stations is in use since the harmonic distortion depends on the amount by which the r.f. and i.f. circuits are off-tune. A similar type of station may be used as a repeater for mobile schemes, as shown in Fig. 2.

From the designer's point of view, one of the most difficult parts of the equipment is the i.f. amplifier, which is carrying the full system deviation but at a low radio frequency. The circuits must have sufficient bandwidth to cause low phase distortion and yet provide the required selectivity and gain. Other problems are the transmitter driver and multiplier stages, where the valves must work into low Q circuits and yet provide a reasonable power output. Aerials and aerial feeders are another source of distortion, the distortion from the aerials being due to their phase characteristic, and that due to the feeder being caused by echoes. Any echo signal may cause distortion and may be due to multi-path propagation from a single transmitter, echoes due to feeder cables, or the same intelligence from two transmitters on the same frequency in area coverage schemes. Its effect is more deleterious with f.m. than with a.m.

Harmonic Distortion

With f.m., the harmonic distortion is proportional to the ratio of the echo signal to the main signal, whereas with a.m. the harmonic distortion is proportional to the square of the ratio of the echo signal to the main signal, assuming that the echo signal is at least 30 db less than the main signal and that the depths of modulation are small. With an echo due to a feeder cable, the magnitude of the echo (and, in the f.m. case, the harmonic distortion) will be proportional to the product of the reflection coefficients at the ends of the feeder. It is difficult to obtain a good match between the transmitter output and the feeder, and yet a reasonable power output, so the reflection coefficient at the aerial junction must be kept at a very low value.

Some typical values of s.w.r. (standing-wave ratio) at the aerial junction are 1.05 at the centre of the modulation band and 1.15 at the edge of the modulation band. Such low values of s.w.r. call for

extreme care in the selection of feeders and types of aerial, and require fairly elaborate measuring equipment to check them at v.h.f.

The harmonic distortion increases with increased feeder length and increasing modulating frequencies, and is therefore most troublesome with wideband systems employing large numbers of channels.

With small numbers of channels, the audio band of frequencies in use may be less than an octave so that second harmonic distortion would not appear to be a problem. However, in addition to the second harmonic distortion, other modulation products due to higher order harmonics are always generated and will appear as crosstalk or noise in the speech channels whether the multi-channel equipment is octave, or non-octave working.

A consideration of the technical difficulties and requirements mentioned leads to the following system requirements. The radio links should be line-of-sight to avoid any possibility of multi-path propagation effects; aerial feeders should be kept as short as possible and should be well matched, both to the aerial and to the radio equipment. Aerials should have the maximum gain consistent with a low standing-wave ratio over the modulation bandwidth. Non-demodulating repeater stations should be used wherever possible.

A primary requirement for multi-channel relay systems is reliability, but often certain stations will be unattended and especially those in remote localities. This calls for the provision of standby equipment and automatic monitoring and changeover in the event of a breakdown. In the event of a failure and changeover to standby, special signals are usually sent along the "engineer's channel" giving an indication at the terminal stations which station has changed to standby, and on what unit the fault has occured. These requirements for automatic changeover and fault signalling are often the largest and most expensive single piece of equipment and themselves tend to increase the unreliability. A realistic view should be taken of the fault signalling and equipment changeover requirements, so as to reduce the ancillary equipment to the minimum.

DRYING OUT TRANSFORMERS

Techniques for Preventing Breakdowns in Tropical Climates

By J. MACINTOSH,* A.M.Brit.I.R.E.

TEMPERATURE: 90.9 degrees maximum, 71.7 degrees minimum. Maximum humidity: 99 per cent. These are not unusual figures for Malaya during the rainy season. In the tropical climate of that country, one of the most humid in the world, nearly all radio components wound with wire take up moisture from the atmosphere, and breakdowns are quite common. The chief items affected are mains and audio frequency transformers and chokes, and impregnation of the windings does not prevent moisture being picked up. In Malaya and other tropical countries a good air-cooled transformer should not require drying out if left out of commission for a period not longer than about three months. In the United Kingdom this period could be doubled, provided the transformer is in a well-ventilated chamber.

Insulation Resistance Readings

As a result of the complete breakdown of the primary winding of a mains transformer (supplying 1,100 volts at 300 mA), experiments were conducted over a period of several months in order to discover the best method of drying out and so reduce the risk of such breakdowns. A large number of transformers were available and careful measurements were taken on a Megger of the resistances (a) primary winding to framework, (b) secondary winding to framework, (c) primary to secondary, on each one under test. The transformers to be dried out—generally two or three at a time—were placed under an inverted packing case, which was covered with an old blanket to keep in the heat. Two or three electric light bulbs, each 75 to 100 watts, were placed under the packing case and fairly close to the transformers, care being taken to prevent damage from fire or excessive heat. The current was then switched on and the drying out commenced. At the end of every 24 hours a fresh set of resistance readings was taken, and so on for three days or more. The resistances were read at the end of the

TABLE 1

Insulation Resistance Readings in Megohms between Primary and Frame

Apparatus	At Start	1st day	2nd day	3rd day	4th day	when cold
h.t. transformer	10	0.7	0.8	0.9	3.5	40
l.t. transformer	7	0.6	1.2	1.8	12	50
h.t. and l.t. transformer	10	5	5.5	—	—	20
h.t. and l.t. transformer	13	9	17	—	—	50
receiver transformer ..	17	7	5	4.5	6	30

* Amateur radio station GM3IAA (ex VS1AA, Malaya).

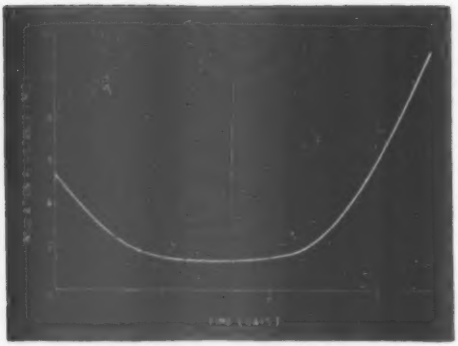


Fig. 1. Typical graph of insulation resistance readings.

drying out period and then again when the transformers had cooled. The results are shown in Table I. As the primary winding is the one which usually fails, the readings given here are confined to the insulation resistance between the primary winding and the frame of the transformer.

The progress of drying-out can be followed easily by keeping a record of such readings taken at regular intervals. For the first 12 to 36 hours, depending on how much moisture has been absorbed, the insulation resistance falls (Fig. 1). During a certain period the reading remains steady at a low figure. It then begins to rise, at first slowly, then more quickly. At this point the drying-out can be discontinued. When the transformer has cooled off the final figure should be 10 to 20 megohms or higher. All insulating materials have a lower resistance at higher temperatures and the increasing resistance as the transformer cools off is quite normal.

Potted Transformers

Several of the transformers undergoing this process behaved in a strange manner, and all these had one thing in common—they were either potted or dipped in bitumen compound. Two typical sets of readings for potted transformers are shown in Table 2. The peculiarity about this type of potted or dipped transformer was that the insulation resistance dropped to begin with, as before, but then refused to rise during the process of drying out. At the end of ten days one of the transformers was taken out of the drying box and while it was being allowed to cool off readings were taken every 10 or 15 minutes. The rise in insulation resistance was remarkable, the figures (in megohms) running like this: 5, 6, 8, 10, 15, 20, 25, 40 and eventually over 50. The writer then got in touch with R. E. Earle of the Singapore Harbour Board and sought his advice. Mr. Earle suggested the possibility of a slight acidity in the bitumen compounds which becomes active if the transformer is permitted to absorb moisture. This, of course, is impossible to prevent if the apparatus is left out of service for long intervals. The transformers using these compounds appear to have a low insulation resistance at the drying-out temperature, and this might prove serious, for example, in a fully loaded rectifier transformer working with a high voltage to earth.

All these experiments were carried out using a drying box. However, it has been pointed out that a relatively easy and most effective way of drying out *in situ* would be to apply half the mains voltage to the primaries of all transformers by introducing a bank of lamps in series-parallel formation in one of the leads to the mains. If this method is used, care should be taken to measure the voltage across the primaries and adjust it when necessary. If the voltage is too low more or larger bulbs are required, and if it is too high the bulbs should be changed for ones of smaller wattage. When using this arrangement the centre tap to all secondary windings of h.t. transformers should be broken, or the h.t. otherwise disconnected, as rectifiers must be on full load before the h.t. is applied. The writer uses switches inserted in the centre taps of the windings.

Care should be taken not to overrun any of the lamps. It is better to use two low-wattage bulbs than to run one big one all out.

Need for Ventilation

A long time ago some experiments were carried out in Malaya by one of the Services in an endeavour to find a cure for breakdowns in audio and power transformers and in paper and old-type mica capacitors. A very large receiver was installed in a cast metal case, complete with glands for controls and a rubber joint for the bolted and flanged lid. This receiver broke down in a much shorter time than did old semi-enclosed receivers, in spite of its being in frequent service. When opened up the connections inside were mildewed, copper was coated with verdigris and the inner surface of the case was covered with moisture. It was considered that the solution to the problem was to ventilate as freely as possible unless it was feasible to exhaust and seal hermetically.

With amateur radio equipment in tropical countries the answer is to ventilate freely and keep the apparatus in more or less continuous use. If the apparatus is out of commission for about two months it should be given a dry-out for two or three days—and this applies especially during the rainy season when humidity is at its peak.

So far the writer has been unable to trace any information on this subject in amateur periodicals or handbooks, so he hopes that this article will prove of some value to amateurs, especially to those situated in the tropics. In conclusion the writer wishes to thank Mr. Earle, the Chief Electrical Engineer of the Singapore Harbour Board, for the most useful advice which he furnished during the course of these experiments.

TABLE 2

Insulation Resistance Readings in Megohms for Two Potted Transformers

At Start	1st day	2nd day	3rd day	4th day	5th day	6th day	7th day	8th day	9th day	10th day
5	2.3	1.7	2.5	2.2	2.1	1.75	1	0.5	0.7	2.2
15	5.5	1	0.85	0.6	0.45	0.5	0.6	0.55	0.4	0.7

Manufacturers' Products

NEW EQUIPMENT AND ACCESSORIES FOR RADIO AND ELECTRONICS

Crystal Pickup

THE GP80 pickup recently introduced by Chancery Precision Instruments, Ltd., 64, George Street, London, W.1, is designed to appeal to those who require, among other things, a wide frequency response, and the output is claimed to be within ±2 db from 50 to 11,000 c/s. Separate heads are provided for 78-r.p.m. and long-playing records with stylus radii of 0.0025 and 0.001 in respectively. Stylus pressure is adjustable in the range 14-16 gm for 78-r.p.m. and 8-9 gm for long-playing records. The price, with the two heads, is £4 16s 8d (including tax) or the heads can be purchased separately for £1 16s each (including tax). The tone arm with one head costs a total of £3 0s 8d.

Electronic "Stethoscope"

VERY low frequencies—some of them below the audible range—can be picked up and amplified by a new type of instrument recently introduced for visual and aural observation of the functioning of the heart and lungs. Described as an "auscultoscope" by its designer, Dr. E. A. Maury, of Paris, it is made under licence by Leland Instruments, Ltd., of 22, Millbank, London, S.W.1. The sounds are picked up from the body by a small electro-dynamic transducer, and the output of this is amplified and applied to a loudspeaker and a c.r. oscilloscope display system. The transducer has an extended low-frequency response to enable it to pick up the sub-audible frequencies of the fundamental heart and lung movements, with a sharp cut-off at the high-frequency end to avoid noises produced by surface contact with the patient's skin.

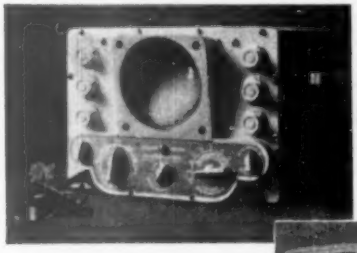
The 6-in cathode ray tube of the oscilloscope display system has a long-persistence screen to permit observation of very low frequency traces. The time base provides low horizontal sweep frequencies which can be adjusted to the rate of the patient's heart beat, and the control for doing this is calibrated to indicate the number of beats per minute. A sync control enables the time base to be locked to the fundamental frequency of the heart beat.

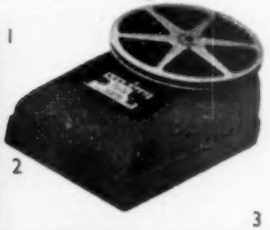
Recording Tape Eraser

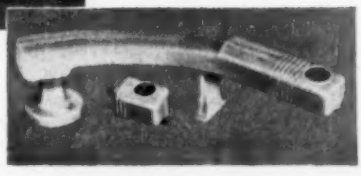
A NEW technique for erasing old recordings from magnetic tape is to place the whole spool of tape in an intense alternating magnetic field. It has several advantages over the more usual method of running the tape through an erase head, the principal ones being saving in time, less wear and tear on plastic tape and the release of the recording machine for more useful purposes.

A device of this kind has recently been introduced by Leevers Rich Equipment, Ltd., 37, Wardour Street, London, W.1. It consists of a light alloy die-cast base with a plastic panel let into the top and housing a powerful electro-magnet. This is supplied with a.c. at 220-250 V at 50 c/s and will demagnetize a 7-in diameter spool of plastic tape in a few seconds. No rewinding is required; the spool of tape is merely placed on the spindle of the bulk eraser, as it is called, rotated and on removal all trace of the old recordings will have vanished leaving the tape completely demagnetized and ready for use again.

The "Leeraser," as it is called, weighs 7½ lb and consumes 1.8 A; price is £7 10s.





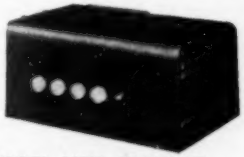


(1) *Leland Instruments electronic auscultoscope.* (2) *Leevers Rich Model ER31B plastic magnetic tape bulk eraser.* (3) *Chancery type GP80 crystal pickup.*

New TRIX Quality

SOUND EQUIPMENT

AC/DC AMPLIFIER



MODEL U88S, 20 WATT.

A most useful and adaptable 20 watt Amplifier, designed for universal AC/DC operation. Inputs for two microphones and gramophone. Outputs both high and low impedance. Completely enclosed and ventilated. Nine valve circuit with negative feedback.
Also available as complete portable equipment—U885 P.

MINIATURE HORN SPEAKER

THE UNICORN MODEL H21

The Unicorn (regd.), a miniature exponential horn type speaker of novel design and construction. Ideal for mobile equipments, factory call systems, railway stations, airports, and other noisy locations.

SEND FOR CATALOGUE AND PRICE LIST OF THE LATEST RANGE OF TRIX SOUND EQUIPMENT.

The TRIX ELECTRICAL CO. LTD.
1-5 Maple Place, London, W.1
Telephone: MUSeum 5817.
Telegrams: Trixadio, Wesdo, London.

AMPLIFIERS MICROPHONES LOUDSPEAKERS

RANDOM RADIATIONS

By "DIALLIST"

Television Coverage

THE ANNOUNCEMENT that reception of the Coronation television broadcasts would be made possible in Tyneside and in the Belfast area by the use of mobile transmitters has been well received. With output powers of 1kW and ¼kW for vision and sound, respectively, these stations will extend the television service to another two million possible viewers, which should raise its coverage of British homes to over 80 per cent. I don't know what the American figure is, but I doubt if it's anywhere near as high. One great difficulty about providing a truly nation-wide service in the United States is that that country contains enormous areas in which the population is still sparse and scattered. We have similar problems, though, naturally, on a much smaller scale. There's one noteworthy difference between the British and American systems. The American sponsored stations derive their revenue from advertisers who naturally want their expensive programmes to be seen and heard by the greatest possible number of likely purchasers of their wares. Hence the layout of such a system is always likely to be that which covers the largest number of homes for the smallest expenditure on transmitting equipment. Our sound and vision services need not necessarily pay their way. The B.B.C. is, therefore, able to provide services in areas that advertisers would regard as valueless.

A Polarization Point

From the B.B.C. I learn that the transmissions from both of the temporary television stations are to be horizontally polarized. The reason is no doubt to avoid interference from the stations with which they will share frequencies (Pontop Pike with Wenvoe and Belfast with London). You will recall that at the recent Stockholm Conference (see p. 433, October) the U.K. representatives made a great point of the conclusion, reached as a result of B.B.C. field trials, that the amount of interference between two metre-wave transmitters using the same channel is at a minimum when they are polarized at right angles to one another. The Conference didn't officially accept this as an established truth, but the allocations made appear to have been largely based upon it. One point about the polarization of the Pontop Pike and Belfast transmissions should, I feel, be made clear to the uninitiated. I've already heard people saying: "Not much fun going to the expense of putting up a horizontal aerial if you'll have to scrap it and put up another when the permanent service gets going." There's no question of anything of the kind. Unlike the transmitters themselves, which are temporary, horizontal polarization will continue to be used when the five permanent medium-power stations come into action.

A Different Sky Line

We've become so used to the sprouting of single vertical dipoles and of H, X and inverted V aerials as part of our urban and village sky lines that we shall feel that we have strayed into some strangely different region when we make future visits to Tyneside and Belfast and see the horizontal contraptions above the roofs. I wonder whether any householder (or perhaps any group of householders) will make use of an array developed for the wartime GLII radar transmitter? This consisted of a line of four half-wave dipoles, spaced at half-wavelength intervals, with a wire-netting reflector about 0.1 wavelength behind them. It's an effective and highly directional arrangement, signal strength being down to one-half at 5 deg either side of the direct transmitter-receiver path. Suitably spaced—and suitably oriented—chimney stacks would be needed. That might be one snag; another (unless my memory is playing tricks) is that the array becomes rapidly less and less effective as the vertical angle of the incoming wavetrain is reduced below about 15 deg.

Apprentice Servicemen

THE RECENTLY ANNOUNCED apprenticeship scheme for radio and television servicemen seems to be an admirable idea. Incidentally, an apprenticeship scheme has been in operation in Scotland for some years. What it comes to, briefly, is that youngsters with a bent for radio will be able to indenture themselves for five years to approved master craftsmen. They will be paid from the start and there will be an annual increase in the weekly rate. The right sort of youngster will, I imagine, work for some registered qualification, such as the City and Guilds' radio or television servicing certificates. The result should be

ASSOCIATED ILIFFE TECHNICAL BOOKS

"WIRELESS WORLD" PUBLICATIONS

	Net Price	By Post
RADIO INTERFERENCE SUPPRESSION as Applied to Radio and Television Reception. O. L. Stephens, A.M.I.E.E. ...	10/6	10/11
RADIO VALVE DATA: Characteristics of 2,000 Receiving Valves and C.R. Tubes. Compiled by the Staff of "Wireless World." 3rd Edition	3/6	3/9
SOUND RECORDING AND REPRODUCTION. J. W. Godfrey and S. W. Amos, B.Sc., A.M.I.E.E., in collaboration with the B.B.C. Engineering Division	30/-	30/8
MICROPHONES. By the Staff of the Engineering Training Dept. B.B.C.	15/-	15/5
ADVANCED THEORY OF WAVEGUIDES. L. Lewin.	30/-	30/7
FOUNDATIONS OF WIRELESS. M. G. Scroggie, B.Sc., M.I.E.E. 5th Edition	12/6	13/-
TELEVISION RECEIVING EQUIPMENT. W. T. Cocking, M.I.E.E. 3rd Edition	18/-	18/8
SHORT-WAVE RADIO AND THE IONOSPHERE. T. W. Bennington. 2nd Edition	10/6	10/10
WIRELESS SERVICING MANUAL. W. T. Cocking, M.I.E.E. 8th Edition	12/6	12/11
RADIO LABORATORY HANDBOOK. M. G. Scroggie, B.Sc., M.I.E.E. 5th Edition	15/-	15/5

A complete list of books is available on application.

Obtainable from all leading booksellers or from

ILIFFE & SONS LTD., Dorset House, Stamford Street, London, S.E.1.

that, quite painlessly and without any kind of compulsion, the radio trade in this country will receive a steady influx of trained and certificated master servicemen. And it can be only a matter of time (and not such a long time either) for the bulk of our servicing work to pass into the capable hands of such men. In the United States people have been pressing vainly for years for the compulsory testing and registration of radio and television servicemen. I can't help feeling that we've found a better way of solving the servicing problem—or, rather, of making it solve itself.

Student Exchange

THE EXCHANGE of students between the seventeen member countries of the International Association for the Exchange of Students for Technical Experience (IAESTE) has continued to deve'op, and during the summer of this year 3,493 students participated in the scheme. The annual figures since the formation of the Association in 1948 to 1951 are 920, 1,236, 1,672 and 2,433 respectively.

So far as this country is concerned 488 students were sent abroad—an increase of 66 on the previous year—and 602 foreign students were received for experience in organizations in this country. Sweden received the highest number of students (820) and Germany sent the largest number abroad (682).

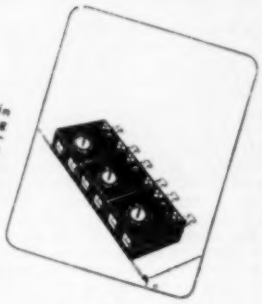
The period of attachment to industry is 8-10 weeks during the summer vacation. The student pays his travelling expenses and the industries receiving the students undertake to pay them sufficient each week to cover their cost-of-living expenses. The average rate of payment varied last year from £3 12s in Yugoslavia, which received 103 students, and £24 10s in Israel, where 44 students were received.

In the table classifying the subjects studied by the students, radio and electronics are not listed separately, but included under the general heading of electrical engineering. However, from a perusal of the list of organizations—both in this country and abroad—receiving students, it is apparent that a considerable number of the 509 electrical engineering students (the second largest individual group) are studying radio and allied subjects.

Details of the IAESTE, which is recognized by UNESCO, are obtainable from J. Newby, Imperial College, South Kensington, London, S.W.7.

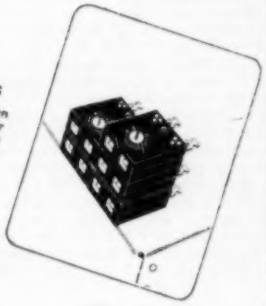
"The Choice of Critics"
Regd. Trade Mark

GROUP THEM IN ROWS
These new connectors, moulded in high grade phenolic thermo-setting plastic, are intended for inter-connection of chassis and structures (e.g., chassis/rack connections) in reliable and unfailing manner, and can be grouped and used to provide non-reversible or polarised connections.



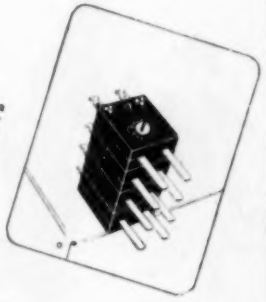
RELIABLE

GROUP THEM IN BLOCKS
Suitable for up to 500V. between adjacent poles and to chassis, and for up to 10A., when used as separable under load. 250W. max. loading is suggested.



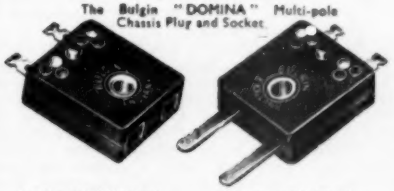
AUTOMATIC

GROUP THEM IN PILES
Fixing is by single screw or rivet, a keying spigot being provided for chassis or base, with counter-hole(s) for key(s) from further unit(s) when stacking, as shown. Also provided with colour-key "sinks," but supplied un-coded.



CONNECTIONS

The Bulgin "DOMINA" Multi-pole Chassis Plug and Socket



List No. P.491 (Socket). List No. P.490 (Plug).

Send for Illustrated Catalogue Ref. No. 190/WW Price 1/- post free.

MANUFACTURERS OF RADIO AND ELECTRONIC PRODUCTS

BULGIN Components
A.F. BULGIN & CO. LTD
BYE-PASS ROAD BARKING

UNBIASED

By FREE GRID

Dehydrated Sailorizing

SOME time ago (March, 1947) I found it necessary to rebuke the Editor in these columns because he had permitted details to be published of the wireless installation in R.M.S. *Queen Elizabeth* but made no mention at all of the men in charge of it (November, 1946). With becoming contrition he cried *Peccavi* and rectified the omission. Now, however, I find a well-known B.B.C. personality, whose very bread and butter depends on radio communication, ignoring not only these men but the ship's wireless apparatus itself.

I refer to Mr. Richard Dimbleby who has earned much well-deserved popularity and fame in his "Down-your-way" series of broadcasts. A few weeks ago he took us aboard the world's biggest ship as she crossed the Channel to Cherbourg. I listened eagerly to this broadcast for I have a passionate interest in ships although I know little or nothing about them. In fact, all I know for certain is that "port is red" no matter whether it be the famous wine from the Oporto district or a ship's left-hand navigation light. This useful mnemonic was given to me by a sailor in a pub as he gazed with withering contempt at the small bottle of port I had

Port is red.

ordered for him in response to the meaning look he gave at his empty tankard.

Naturally I expected that Mr. Dimbleby would stir my blood and my interest by taking his microphone all over the ship to interview people whose occupation was of a nature only to be found at sea, and that as it is radio which has made his name a household word he would begin by interviewing the Chief Radio Officer or one of his underlings who could tell us something of the ship's wireless and radar equipment; but I was doomed to bitter disappointment for instead we heard interviews with the ship's "Nannie" and other members of the "hotel" staff.

It is only fair to say that we did hear interviews with the Staff Captains, the Chief Engineer and a rather lugubrious lamptrimmer. I must confess that I rather feared for Mr. Dimbleby's safety on the perilous descent into the engine room, and I thought he was wise to avoid clambering up into the crows nest, for as he himself will readily admit, he does not exactly fulfil Gilbert's description of "light and airy, like a fairy."

I did not, of course, expect that we should get an interview with the Captain or that the microphone would be allowed on the bridge while the ship was in the busy waters of the Channel, but could not these things have been done and recorded before the ship cast-off? I did not even hope to hear the men "chanty-ing" the unexpurgated version of "I met a maid from Amsterdam" as they trudged round the anchor windlass, but neither did I expect a conducted tour of a hotel.

The Snails Whiz By

AS long ago as October, 1943 I first raised the question of the speed of the ordinary tame domestic current which lights our homes and does the more menial tasks in our radio sets—like cathode cooking—as distinct from the "hotted-up" electrons which flit about our valves and c.r. tubes and rend the heavens in a thunderstorm. Two months later I said that I gathered from a perusal of Morecroft and other authorities on these matters that the current in our more mundane circuits shuffles along in its carpet slippers at almost walking pace.

I briefly referred to the matter again early last year (March, 1951) and I make no apologies for returning to it now for I have just discovered that I was hopelessly wrong in my interpretation of the facts, and, of course, to leave an error uncorrected in *Wireless World* is almost as unthinkable as for a politician to admit one.

My error and, therefore, my shame has just been revealed to me by a perusal of one of the latest works on electrical matters ("Fundamentals of Technical Electricity," by H. G. Mitchell). From it I gather that the maximum velocity of the electrons crawling along a copper conductor is 0.43 centimetre per second. Now because I like nice round figures—due perhaps to my experience as a judge at bathing-beauty contests—I am going to call it 0.5 cm per sec as then we need only multiply both the centimetres and the seconds by sixty to get another round figure of 30 cm per minute. Now we all know that there are approximately 2.5 centimetres in an inch and so obviously we get a velocity of 12 inches per minute, or in other words 60 feet or 20 yards per hour, which is a speed of which even a snail would be ashamed.

If your electricity supply is d.c. it means that the electrons which are now crawling round your lamp filament must have left the generating station several days ago—unless you happen to live quite close to it. In the case of ordinary 50 c/s a.c. it is obvious that it is always the same old gang of electrons which are giving you light, and they don't move more than a tiny portion of an inch before they have to do a smart "about

In the headmaster's study.

turn." In fact, all the electrons do is to shift their weight uneasily from one leg to the other as I recollect doing long years ago when standing before the bar of justice in the headmaster's study.

What of radio frequencies, more especially those of television and the centimetre wavelengths? To us the electrons seem almost static, but taking an electron's-eye view the distance travelled each half-cycle is "galactic" compared with their diameter. No doubt some heresy-hunting technical Athanasius will debunk my words and I shall hang as high as Haman. My tombstone will bear the words "Here Free Grid lies still as he did in life."

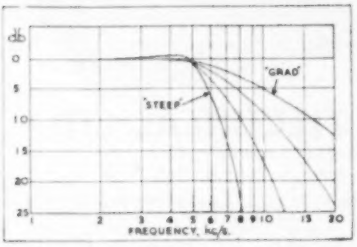
Radio Jubilee

I AM not one of those who believes in change for change's sake, nor, I hope, is the Editor of *Wireless World*. Otherwise he may see next year a reason—or an excuse—for putting the new-fangled word "radio" into the title of this journal. Radio as a word celebrates its jubilee in 1953, having been introduced by the Germans at the first International Conference on Wireless Telegraphy held in Berlin in August, 1903. So long as all our activities are governed by the Wireless Telegraphy Act, the old word is good enough for me.

A RADICALLY NEW PRE-AMPLIFIER FOR LEAK 'POINT-ONE' POWER AMPLIFIERS

The

"Vari-Slope"



Frequency amplitude curves for the "TREBLE—3" position (5 kc/s turnover). Curves of the same slopes are obtained on the other two positions turning over at 7 kc/s and 9 kc/s ("—2" and "—1" positions).

The filters consist essentially of twin-T resistor-capacitor networks inserted in the return circuit of a single-loop feedback amplifier. The more obvious advantages of this electronic feedback method over conventional choke filters include:—

(a) Improved transient response characteristics (due to absence of chokes having self-capacitance) and the consequent reduction of "ringing".

(b) Extremely low harmonic and intermodulation distortion due to negative voltage feedback action.

(c) No discontinuities in the rates of slope when the slope control is operated, and no change in signal level at frequencies below turnover. (Both these faults occur in variable-slope choke filters due to the slope control altering the terminating impedance and the insertion loss.)

(d) There are no chokes to cause magnetic hum pick-up.

(e) Smaller size, lighter weight, greater uniformity in production.

AUDIBLY BETTER REPRODUCTION

from unique

FEEDBACK CIRCUIT DEVELOPMENT

The new "Vari-Slope" pre-amplifier has a refinement which will doubtless set the pattern for future high-fidelity reproducing amplifiers. This advance consists of variable-slope "electronic" low-pass filters operating on negative voltage feedback principles.

No Inductors ("Chokes") are used, and all their disadvantages are completely eliminated. The turnover frequencies are 5kc/s, 7kc/s, and 9kc/s and the slopes of attenuation are continuously variable over the range 5db to 50db per octave.

PRICE £12-12-0 LIST
IN BRITAIN

TO BRITISH USERS OF THE
RC/PA/U PRE-AMPLIFIER

Your old model can be rebuilt as a standard "VARI-SLOPE" at a charge of £8.8.0.

Orders will be booked in rotation.

Please do not send your pre-amplifier to us until we advise you of a date.

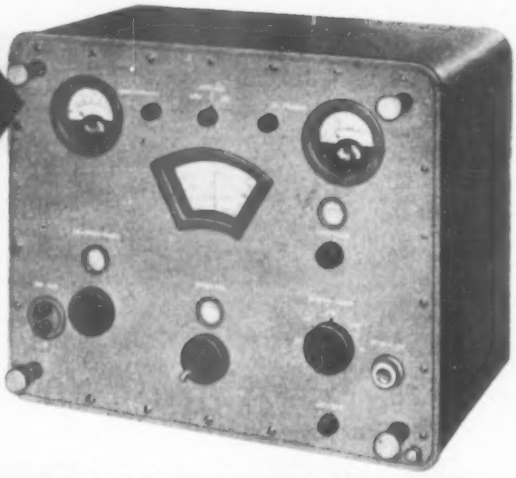
OVERSEAS USERS should contact their national agent regarding the availability of this rebuilding service, which is dependent on freight and reimport duties being reasonably low.

Write for "Vari-Slope" Leaflet

H. J. LEAK & CO. LTD., BRUNEL ROAD, WESTWAY FACTORY ESTATE, ACTON, W.3

Phone: SHEpherds Bush 1173/4. Telegrams: Sinusoidal, Ealux, London. Cables: Sinusoidal, London

PHILIPS *present...*



STANDARD H.F. SIGNAL GENERATOR
—GM 2653 Mains operated

USED FOR producing H.F. signals of great stability and accuracy 32 Kc/s to 32 Mc/s in 8 ranges.

FEATURES:

1 Various ranges selected by means of coil turret.
2 Output variable and by means of tapped attenuator 1uV to 1V (Direct IV).
3 Output cable combined with dummy aerial.
4 Internal modulation 400 c/s ± 2%.
5 Oscillator built in for external modulation 30-12,000 c/s.
6 Modulation percentage variable from 0 to 100%.

SPECIAL OFFER

A new booklet "The Oscillograph and its Applications" is now available in limited quantities, price 5/-. This concisely written book is divided into two parts. The first part describes modern oscilloscopes; the second part contains one hundred typical examples of their use. Profusely illustrated, and invaluable to engineers and technical colleges alike. Copies may be obtained from:

PHILIPS ELECTRICAL LTD.
INDUSTRIAL DEPARTMENT
CENTURY HOUSE · SHAFTESBURY AVENUE · LONDON · W.C.2.

INDUSTRIAL X-RAY EQUIPMENT . ELECTRONIC APPARATUS . LAMPS & LIGHTING EQUIPMENT . ARC & RESISTANCE WELDING PLANT & ELECTRODES . RADIO & TELEVISION RECEIVERS . MAGNETIC FILTERS BATTERY CHARGERS & RECTIFIERS . H.F. HEATING GENERATORS

(P.1.221)

"Cyldon" Precision Variable CAPACITORS

Miniature Trimmers, to High Voltage Transmitter Capacitors

For precision, stability, and long life, "Cyldon" superiority is recognised by all designers and users of electronic equipment

S Type Capacitor
This single-section split-stator capacitor is complementary to the multi-gang 'R' type and similarly is normally manufactured with stator terminals only to give series capacity characteristics, for use in push-pull circuits. High-grade ceramic insulation, silver-plated brass rotor and stator assemblies and fitted ball-races ensure long life and electrical efficiency.
Available in a variety of capacity and voltage combinations, the 'S' type capacitor will have a strong appeal to designers of High Frequency communications equipment.

Enquiries invited from Equipment Manufacturers and Wholesale Trade only.

● *Full details of the complete "Cyldon" range, and list of Overseas Agents, available from the Manufacturers*

SYDNEY S. BIRD & SONS LTD
Contractors to Ministry of Supply, Post Office and other H.M Government Depts.
CAMBRIDGE ARTERIAL ROAD ENFIELD · MIDDX *Enfield 2071-2*

WE PAY TOP PRICES

For American Surplus Electronic Equipment

Any quantity or condition

LOOK AT THESE EXAMPLES

for equipment in good condition

Receiver R54/APR4 with tuning units TN16, 17, 18, 19 (or bought separately)	£110
Receiver AR88D	£55
Frequency Meter TS/175	£80
TX/RXRT18/ARC1	£50
Test Set 1—100	£50

We pay similar Remarkable Prices for

Receivers APR1, APR4, APR5, R5/ARN7, BC348, BC342, BC312, R78/APS15, APN9.
Frequency Meters BC221, TS174/U
Test Sets TS3, TS13, TS14, TS17, TS19, TS33, TS34, TS45, TS47, TS59, TS69, TS102, TS118, IE19
Transmitters ART13, SCR522, TRC1, TCS6-12-13, SCR300, BC1000
Synchronisers BC1148 **Modulators** BC1142

Phone us immediately, transfer charge

ALTHAM RADIO CO.
BRAZENNOSE STREET, MANCHESTER 2
Tel.: DEAnsgate 5387

LEAK

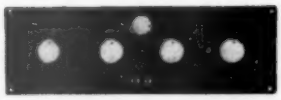
L·R·S

Estd. 1925

EASY TERMS

QUALITY EQUIPMENT

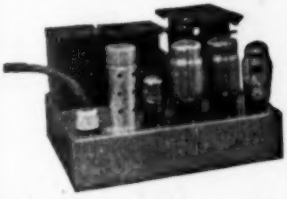
FOR THE CONNOISSEUR



THE NEW "VARI-SLOPE" PRE-AMPLIFIER for the famous Leak "Point One" Power Amplifier. For full details see maker's advertisement on page 85. CASH PRICE **£12-12-0**

THE INCOMPARABLE TL/12 12 WATT TRIPLE LOOP FEEDBACK "POINT-ONE" AMPLIFIER which has won world-wide recognition by its pre-eminence in performance, reliability and craftsmanship.

CASH PRICE **£28-7-0**



TERMS FOR THESE TWO UNITS: £9-0-0 deposit with order and 18 monthly instalments of **40/-**. LEAK TUNER & DYNAMIC P.U. also available on similar terms. All above available separately.

WHY ARE MORE AND MORE MEN CHANGING TO ELECTRIC SHAVING?

BECAUSE THE AMAZING *NEW* REMINGTON *Contour 6*

Electric Shaver really **DOES** give a **Cleaner—Smoother and Faster** Shave than **any other method.** We have carefully tested every make of Electric Shaver available to-day and in our opinion the Remington is the finest of them all. ***TO CONVINCE YOU*** **our**

14 DAYS FREE TRIAL

IS AVAILABLE FOR 20/- DEPOSIT

(Returnable if shaver not entirely satisfactory) Balance payable by 8 monthly instalments of **21/-**. Cash price **£8.19.6.** AC DC 200 250. Other voltages available. Every shaver brand new and despatched by return in superb silk lined presentation case. Brochures free.

FREE TRIAL for only 20/- DEPOSIT (returnable)

THE L.R. SUPPLY COMPANY LTD.

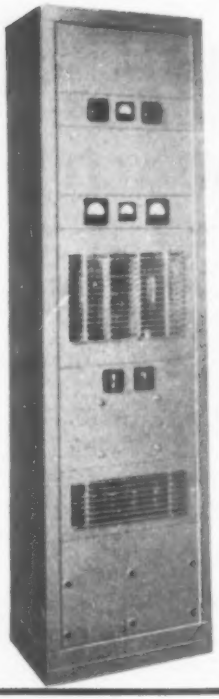
LONDON RADIO SUPPLY COMPANY

BALCOMBE *Est. 1925.*

★ Have you investigated this **NEW** SOURCE OF POWER . . . ?

THE NEW SAVAGE
V.L.F* AMPLIFIER

* VERY LOW FREQUENCY



1 KILOWATT AT FREQUENCIES DOWN TO 10 c/s

Here is a compact, easily controllable source of power at frequencies between 4 c/s and 2,000 c/s.
Already used by the Research Departments of leading aircraft and engineering concerns for *Vibration Testing* on materials and structures, this instrument is proving an invaluable aid in many important new fields of development.
Let us send you full details and prices without delay.

BRIEF SPECIFICATION

Frequency Range at 1,000 watts 10 c/s-1,000 c/s
Response characteristic ... ±½ dB 4 c/s-2,000 c/s
Gain ..... 84 dB
Noise Level ..... −70 dB

For frequencies between 40 c/s and 14,000 c/s, we recommend the Savage Mark II Kilowatt Amplifier.

W. BRYAN SAVAGE LTD
WESTMORELAND ROAD, LONDON, NW9
Telephone: COLINDALE 7131

"EXCEL"
MAGNETIC TAPE RECORDERS

Although designed primarily for high quality synchronised sound with sub-standard film projectors, the EXCEL is used as a first class recorder for high fidelity work.

- WIDE FREQUENCY RESPONSE
- FREEDOM FROM "WOW" AND FLUTTER
- 10½ in. DIAMETER FLYWHEEL
- SUPERIMPOSING
- NOISE SUPPRESSION
- TAPE CAPACITY: 3,250 ft.
- PORTABLE. WIDTH 14½ in. DEPTH 17½ in. HEIGHT 8½ in.

For full details and nearest Agent please write to
EXCEL SOUND SERVICES LTD.
NORWOOD WORKS, NORWOOD AVE., SHIPLEY, YORKS.
Telephone: Shipley 51291.

HIGH STABILITY RESISTORS
available in ratings from 0·063 up to 2 watts and with tolerances of ±0·5% ±1% ±2% ±5% and ±10%

CARBON POTENTIOMETERS
Switch and non-switch types, Linear, Pos. and Neg. Log. Law.

Sole U.K. Concessionaires :—
G. A. STANLEY PALMER A.R.Ae.S.
MAXWELL HOUSE, ARUNDEL ST., LONDON, W.C.2
TEM. Bar 1610

miniature in size...

mighty in performance

Pardon us for blowing our own trumpet so loudly, but OSMOR "Q" RANGE COILS really do beat the band. No imitation, regardless of price, can compare with them for super selectivity and sensitivity. And you don't just have to take our word for it—the watertight guarantee makes your satisfaction certain! Consider these points of superiority:—

★ **Only 1 in. high.**
★ **Variable iron dust cores.**
★ **Low loss Polystyrene formers.**
★ **Packed in damp-proof containers.**
★ **Fitted tags for easy connection.**

COILPACKS. A full range is available for Superhet and T.R.F. Mains or Battery. Size only 1⅜in. high x 3¼in. wide x 2¼in. Ideal for the reliable construction of new sets, also for conversion of the 21 RECEIVER, TR 1196, TYPE 18, WARTIME UTILITY and others.

Aligned and tested, with full circuits, etc. Fully descriptive leaflets available.

WARNING!!

Any coils from fire, salvage or similar sources are not subject to our guarantee and service. Buy from reputable dealers only.

OSMOR

Outstanding Quality Lines of Interest

You'll get a shock—

the first time you hear your own voice! Have fun and find endless pleasure in using an **inexpensive TAPE RECORDER** you can build yourself. We can supply all the parts to make a really efficient unit, utilising your gramophone turntable (which can still be used for its normal purpose). Send **2/6** only for easy-to-follow blueprints and instructions, or ask for details.

FOUR for the Price of TWO!

The NEW OSMOR CHASSIS CUTTER!

of entirely new design. Cuts two sizes of holes with any one reversible punch and die; and can be operated with a spanner or tommy-bar. Blanks easily removed.

Punch and Die sizes: No. 2—⅞ x 1⅛in. No. 3—1⅜ x 1⅝in. } *Enquiries for other sizes are welcomed.*

Supplied complete with both No. 2 and No. 3 punches and dies for **30/-** (postage and packing 1/3), or 16/- one punch and die only. (Please state which.)

A spotlight on just one of the range of Osmor "Q" coils.

H.F. CHOKE Type Q.C.1.

Frequency coverage 150 kc/s. to 20 m/c.
Iron-dust core and single-screw fixing
Prototype tested and approved by M. G. Scroggie, B.Sc., M.I.E.E. Ideal as anode load in TRF receivers, for decoupling and general purposes. Price 4/-.

We keep stocks of many radio components for use in published circuits, including the following:

"WIRELESS WORLD"
"NO COMPROMISE" TRF TUNER, by W. WINDER, A.M.I.E.E. (Osmor coils QA11 and QHF11 for M.W. and QA12 and QHF12 for L.W. are suitable, price 4/- each.)

"MIDGET MAINS RECEIVER," by W. AMOS (Osmor coils QA11 for M.W. and QA12 for L.W. are suitable. Price 4/- each.) and others.

"PRACTICAL WIRELESS"
"3-SPEED AUTOGRAM."
"MODERN 1-VALVER."
and others.

Keep those small components—resistors, condensers, etc., neatly stored yet visible, by using an

OSMOR "JAR-RACK"

(If you're a generous husband you'll buy one or two for your wife's larder, too—she will appreciate somewhere to store her preserves.) Holds any 1 lb. jam jars which are easily removed but cannot fall out. Just the thing for the tidy "HAM" or Radio Dealer.

Type 1 for wall-fixing, as illustrated, **6/9** each, holds 8 jars. (Jars are not supplied but are easily obtained.)
Length 24in., enamelled olive green.
Type 2 for screwing under a shelf, **5/9** each, holds 6 jars.
Length 18in.
(Trade discount allowed to Dealers.)

DIALS

Metal dials, overall size 5¾in. square, as illustrated. Cream background, 3-colour. Type M1, L.M.S. waves. M2, L. & M. waves. M3, M. & 2 S. waves.
Price **3/6** each.

Pointer, **1/6**; Drum, Drive, Spring and Cord, **3/2**. **Larger glass dial assemblies are available**, measuring 7in. x 7in. (9¾in. x 9¾in. overall). Mounts in any position. Choice of two 3-colour scales.

Dear Reader,

We can't mention all our products here, but shall be glad to receive your enquiries. If it's top-quality components and a speedy, courteous service you are looking for—try Osmor. We really shall do our best for you.

FREE! *Send 5d. (stamps) for* **FREE CIRCUITS** *and full lists of coils, coilpacks and radio components*

OSMOR

radio products ltd

(Dept. W.36) BRIDGE VIEW WORKS, BOROUGH HILL, CROYDON, SURREY. *Telephone:* **Croydon 5148/9**

MODERN ELECTRICS LTD.,

164, Charing Cross Road, London, W.C.2. 'phone TEMple Bar 7587.

Export enquiries welcomed. Immediate delivery from stock. Prompt attention to post orders.

TAPE RECORDERS

SOUNDMIRROR
Table Model £69 10 0
Portable £74 10 0

SCOPHONY-BAIRD
New Model Mk. 2, complete £68 5 0

SIMPHONIC
New Model IA £83 0 0

GRUNDIG " 2-Track 50 10,000 c.p.s., press-button control £78 15 0

RECORDING TAPE

SOUNDMIRROR
Paper Tape £1 5 0
Spare Spool 6 6

E.M.I. H.60, 1,200ft. £1 15 0
E.M.I. H.60, 600ft. £1 1 0
E.M.I. H.65, 1,200ft. £1 15 0
E.M.I. H.50, 1,200ft. £2 8 0

SCOTCH BOY
1,200ft. £1 15 0
SCOTCH BOY, 600ft. £1 1 0
Spare Spools, 1,200ft. 4 3
Spare Spools, 600ft. 3 3

E.M.I. H.57, 3,250ft. £6 0 0

SIMPHONIC
As advertised on page 27 ..... £1 15 0

VALVES
We are one of London's Largest Stockists — Please write for requirements.

RECORD REPRODUCING EQUIPMENT

DECCA
2-speed Motors, complete with Turntable and Rubber Mat £3 18 6
3-speed, complete £6 8 6

B.S.R.
3-spd. (Crystal T/O Hds.) £9 19 11
3-spd. (with 2 GP23 Hds.) £11 16 6
3-spd. (with 2 Decca Hds.) £13 18 6
3-spd. Auto-Mixer £17 17 0

GARRARD
R.C. 75 (3-spd. Auto.) £16 16 6
R.C. 75A, as above, but less heads £14 10 3
S.201.B. Variable 3-spd. Transcription Motor £24 12 6

CONNOISSEUR
3-spd. Deck £23 13 0

SPEAKERS IN STOCK

GOODMANS
Axiom 150, Mk. 2 ..... £14 16 10
Audiom 60 ..... £12 6 3

WHARFEDALE
W.12.CS £14 6 0
Golden 10C.S.B. £9 0 5
Super 8CS/AL £7 4 4
Super 5CS/AL £7 4 4
Bronze 10 ..... £3 9 6

TEST GEAR

AVO
Model 8 ..... £33 10 0
Model 7 (latest) £19 10 0
Uniminor Mk 1/2 ..... £10 10 0
Electronic Meter £40 0 0
Wide Band Sig./Gen. £30 0 0
Valve Characteristic Meter £60 0 0
D.C. Minor £5 5 0
10 kV. Multiplier for Model 8 ..... £2 5 0
Carrying Cases for Models 7, 8 and 40 ..... £3 0 0

ADVANCE
H.1 (Sig./Gen.) £25 0 0
E.2 (Sig./Gen.) £28 0 0

PIFCO. Radiometer £1 9 6

COSSOR
Double Beam Oscilloscope Single Beam £93 10 0
..... £28 0 0

TAYLOR
ALL NEW TAYLOR TEST GEAR IN STOCK AND AVAILABLE ON H.P. Send S.A.E. for Catalogue and Terms.

PICK-UPS

ACOS
GP.20 (Std. or L.P.) £3 11 5
Spare Heads for above £2 3 4

DECCA
XLT.0 ..... £3 19 2
XMS. Magnetic £7 0 0

CONNOISSEUR
Super Lightweight, LP.Std. £10 0 8
Spare Heads £3 11 8

LEAK PICK-UPS
Dynamic (Ruby Stylus) £12 0 0
Dynamic (Diamond Stylus) £18 8 4

MICROPHONES

ACOS
Mic 22 (Crystal) £6 6 0
Mic 22 (head only) ... £4 10 0
Mic inserts for above £1 9 6
Mic 16 (Crystal) £12 12 0
Mic 30 (Crystal) £4 4 0

SOUNDMIRROR
M.C with T/F £7 7 0

LUSTRAPHONE
M.C with T.F.C.51 ... £5 15 6
M.C less T.F.C.51 ... £5 5 0
Heavy Table Base for above £1 1 0
Hand M/C with T/F CH.51 ..... £6 6 0
Hand M/C less T/F CH.51 ..... £5 15 6

RESLO M/C (Low Imp.) £6 0 0
RIBBON £7 5 0

FLOOR STAND
(Microphone), 3 extensions £3 12 6

LEAK AMPLIFIERS
Point 1, TL12 ..... £28 7 0
Point 1, TL25 ..... £34 7 0
Control Unit £12 12 0

CONNOISSEUR AMPLIFIERS
Q.25, in Cabinet £48 10 0
Q.25, less Cabinet ... £41 5 0

TAPE DECKS
SOUNDMIRROR—With Complete Instructions for Associated Amplifier ... £33 0 0, carriage extra.
WEARITE (limited stock), with Complete Instructions for Associated Amplifier, £35 0 0, carriage extra.

EXPORT AND TRADE ENQUIRIES INVITED

Type A1 record and replay amplifier with Power Pack Oscillator £60 0 0

Type C1 record and replay amplifier. 6 watts push pull output with Power Pack Oscillator £63 0 0

Type F tape record/playback amplifier with Power Pack Oscillator for 2 head tape decks £36 0 0

Bradmaster type 5 Tape Desk with 6 RP Heads £42 0 0

C. J. R. Oscillator Coils. Type 1B Oscillator ..... 9s. 0d.

C. J. R. Oscillator Coils. Type 1B Plate ..... 9s. 0d.

C. J. R. Bias Rejector Units ..... 12s. 6d.

Tape Recorder, Type D1
The model D1 consists of a High Quality recording amplifier — replay amplifier and Power Pack Oscillator mounted with a high quality Tape Desk into a Rexine covered case, complete with low impedance desk type moving coil microphone, mains lead, microphone lead, reel of 3 mm's magnetic tape and spare reel. 3 watts output **with full monitoring facilities.** Programme level meter and external speaker socket with selection of three impedances. Leaflets describing the above Recorder sent on request. Type D1 Tape Recorder £119.15.0
Type D1 Tape Record/Replay amplifier, specification as above with Power Pack Oscillator (as separate units) £51.5.0
Rexine Case £9.10.0

C.J.R. ELECTRICAL & ELECTRONIC DEVELOPMENT LIMITED
BICKFORD RD · WITTON · BIRMINGHAM · 6

CITY & RURAL

IMMEDIATE DELIVERY FROM STOCK

"VIEWMASTER"

SPECIFIED COMPONENTS

Send for Stage 1 now — price £3/2/3, post free. Complete Kits, Stage-by-Stage and Single Components Supplied. "Viewmaster" Construction Envelopes ... ...7/6 ea.

LARGE STOCKS GENERAL TELEVISION COMPONENTS

MANUALS : "Television Explained," 9/-. "T.V. Fault Finding," 5/-. "Wireless World" Valve Guide, 3/6. All manuals post and packing 6d.

TRANSFORMERS : 30 v. 2 a. for models, etc., Tapped 3-4-5-6-8 9-10-12-15-18-20-24 v., 21/- ; 350-0-350 v. 80 mA. 6.3 v. 4 a., 5 v. 2 a., 21/-. Ditto but 250-0-250 v., 21/-. Heater 6.3 v. 1.5 a., 7/6. 350-0-350 v. 150 mA. 6.3 v. 5 a., 5 v. 3 a., Fully Shrouded, 45/- ; EHT 2.5 Kv. 5 mA. 0-2-4 v. 4 a., 0-4 v. 2 a., 45/-. All Primaries 200-220-240 v.

METAL RECTIFIERS : 6 v. 1 a., 5/6 ; 12 v. 1 a., 9/9.

ALUMINIUM CHASSIS : 6 x 4 x 2½in., 4/9 ; 8 x 6 x 2½in. 6/4 ; 10 x 7 x 2½in., 7/7 ; 12 x 8 x 2½in., 9/6.

S.T.C. METAL RECTIFIERS : E.H.T. K3/40, 7/6 ; K3/45, 8/2 ; K3/50, 8/8 ; K3/100, 14/8 ; H.T. RM0, 5/- ; RM1, 5/3 ; RM2, 5/9 ; RM3, 7/- ; RM4, 21/- ; DRM1B, 11/6 ; DRM2B, 12/6 ; DRM3B, 15/-.

CO-AXIAL CABLE : All makes in stock. Belling 72 ohm, Twin Feeder, 7½d. yard.

LOUDSPEAKERS : 8in. PM, 19/6 ; 6½in. PM, 18/6 ; 3in. PM, 13/6.

CLEAREX 6in. ENLARGERS (for VCR97, etc.), 22/6.

M.C METERS : 0-50 mA. 2in. square, 9/-.

Terms : C.W.O. or C.O.D. over £2. Over £2 post free, otherwise please add 1/- post and packing.

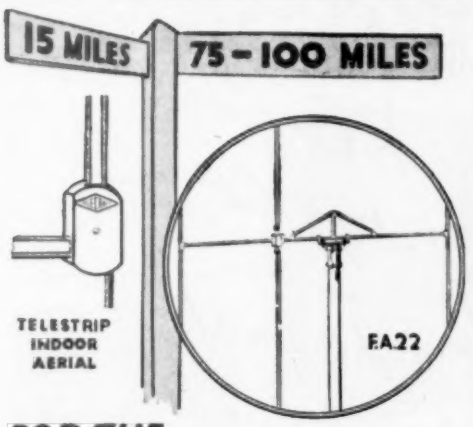
MATCHED VALVES, RESISTORS, &c.

Extensive Stocks New and Surplus Components, Special Purpose Valves, &c.

FOR ATTENTION—ADVICE—SERVICE, WRITE :

CITY & RURAL RADIO,
101, HIGH STREET, SWANSEA, GLAM.

Telephone : Swansea 4677.



FOR THE
RIGHT *DISTANCE –*

THERE IS ALWAYS A RELIABLE

TELECRAFT

Telecraft Aerials—indoor and outdoor—are not a hasty product of the television boom. They have been steadily and systematically developed to their present stage of perfection during the past fourteen years. This is why Telecraft Aerials are unsurpassed for efficiency *and* reliability — *why they are the first choice of those who know that they are*

BETTER THAN ANY—CHEAPER THAN MOST

Send for Descriptive Literature

TELECRAFT LIMITED

THORNTON HEATH, SURREY

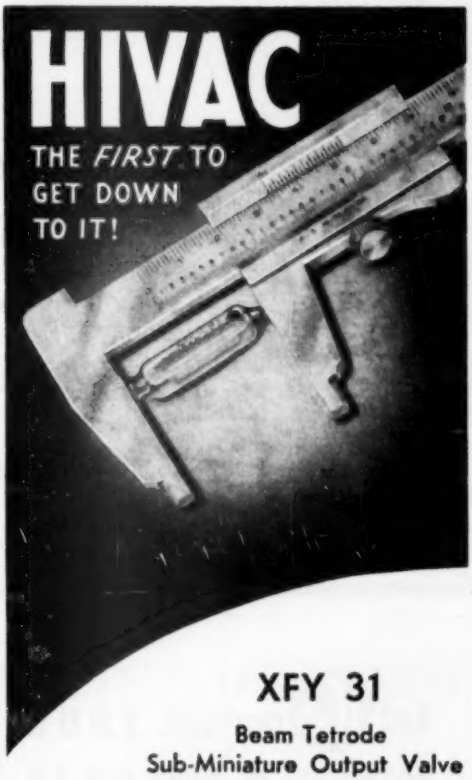
THOrnton Heath 1191-2-3

SCOTTISH SALES AND SERVICE DEPOT:
423, Clarkston Road, Glasgow, S.4.
Merrylee 4326
Depots: B'HAM, BRISTOL, MANCHESTER, WORTHING, PLYMOUTH

SUB-MINIATURISATION

HIVAC

THE *FIRST* TO GET DOWN TO IT!



XFY 31

Beam Tetrode
Sub-Miniature Output Valve

TYPICAL OPERATION

Filament Voltage	1.25	1.25 V.
Filament Current	12.5	12.5 mA.
H.T. Voltage	22.5	30 V.
Control Grid Voltage	0	– 1.2V.
Power Output	1.8	3.3 mW.

The maximum cross-section is only 8 mm. x 6 mm. with a maximum glass length of 35 mm. and the nominal filament current is 12½ mA.

These features, in conjunction with the high efficiency of the XFY31 permit still greater saving in space whilst maintaining exceptionally fine performance.

HIVAC
THE SCIENTIFIC VALVE

Hivac Ltd. Telephone: HARrow 2655
GREENHILL CRESCENT, HARROW-ON-THE-HILL, MIDDLESEX

with confidence, as only OKERIN Waxes are used.

Yours faithfully,
J. Power Factor

P.S.
Waxes are small in bulk but
bulk large in importance —
they must be just right for the
job and reliable Specify OKERIN.

Sales Department
ASTOR BOISSELIER & LAWRENCE LTD.
9, SAVOY STREET · STRAND · LONDON · W.C.2
Works and Laboratories · WEST DRAYTON · Middlesex

Let I.C.S perfect YOUR knowledge of radio and T/V

THOSE who wish to supplement their existing knowledge with a sound technological background and, if necessary, pass qualifying examinations can do so by means of I.C.S. Home Study Courses. These include **RADIO ENGINEERING . RADIO SERVICE ENGINEERING . RADAR, ELEMENTARY ELECTRONICS, ADVANCED SHORT WAVE RADIO . RADIO . T.V TECHNOLOGY and training for the following examinations—B.I.R.E. . P.M.G. CERTIFICATES FOR WIRELESS OPERATORS . C. & G. TELECOMMUNICATIONS C. & G. RADIO SERVICING CERT. (R.T.E.B.) . C. & G. RADIO AMATEURS** . etc., etc.

Students are coached until successful. Fees are moderate and include all books required.

GENEROUS DISCOUNT TO H.M. FORCES

WRITE TODAY for FREE BOOKLET describing complete facilities for the successful study of Radio and T/V technology.

INTERNATIONAL CORRESPONDENCE SCHOOLS LTD.
Dept. 223B, International Bldgs., Kingsway, London, W.C.2
Please send booklet on subject .....
Name ..... Age .....
(BLOCK LETTERS, PLEASE)
Address .....

CITY SALE & EXCHANGE Ltd.

Offer the following from stock :-

LEAK

TL/12 Point One Amplifier with Vari-slope preamplifier, **39 gns.** Variable selectivity Radio Tuner with magic eye, **£30/5/-.** Dynamic Pick Up with ruby stylus, L.P. or standard, **12 gns.** Transformer for same, **£2/15/-.**

LOWTHER

L.F.S. Radio Tuner, 6 valves, 3 waves, magic eye, **£25/15/4.** DT4 Tuner, 7 valves, 3 waves, superhet or straight, cathode follower output, magic eye, **£37.7/10.** N.B. We can supply these tuners complete with lead and plug to fit the Leak TL/12 at **7/6** extra.

ROGERS

"R.D." Junior de Luxe, push-pull Amplifier, with separate Junior preamplifier, **£28/10/-.** Baby de Luxe 5 watt Amplifier with Junior preamp., **£21.** Or with the Baby preamplifier, **£18.** Minor Amplifier with engraved control panel, **£11.** Corner Reproducer with 12in. dual cone unit, **£56/5/-.**

Easy payments arranged. Deposit one third, and the balance plus 10 per cent. payable over 12 months. Write for details.

Let us quote you a part exchange allowance on your present equipment.

All the equipment mentioned above is demonstrated in our showrooms. Mail Orders our speciality.

93-94 FLEET STREET
LONDON, E.C.4 (Ludgate Circus) *Phone : Central 9391*

LEWIS RADIO COMPANY

CABINETS

Send for our latest catalogue of T/V, Radiogram, Table and Corner speaker cabinets. Individual cabinets made to specification.

CHASSIS

Send 3/6 for blue print and full details of our A.C. 5-valve, 3 waveband superhet Radiogram chassis.

SPECIAL OFFER

Midget Walnut cabinet 12in. x 7in. x 5in., complete with punched chassis, dial, backplate, drum, drive, cord, spring, pointer.

28/6d.

Plus 2/6d. P. & P.

T/V CABINETS

Handsome walnut T/V Cabinet, 16in. wide x 20in. x 34in. For 9in., 12in. or 15in. tubes.

£8 8s. 0d.

Plus £3 deposit on crate, returnable, less carriage charge.

COMPONENTS

We stock all radio and T/V components. Send for our lists.

LOUDSPEAKERS

We stock all Goodman's speakers.

Axiom 150 Mk. II available at £14/13/4.

GRAMOPHONE MOTORS AND PICK-UPS

All the latest Autochangers and pick-ups in stock.

AMPLIFIERS

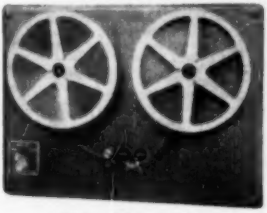
Models from 4 to 15 watts. From £3/19/6.

Details on request.

THE VIEWMASTER

Send for *OUR* Shopping List. All specified components for London and all other areas available from stock.

THE "MOTEK" TAPE DECK



£15 15s. 0d.

Twin track recording giving 1 hours playing at 7½in. per sec. 3 Collaro motors. High impedance heads. "Rewind" and "Fast Forward" in 1 min., without unlooping tape. Size 16in. x 11½in. x 4½in. depth. For A.C. 200/250v. Each deck is fully tested in actual operation before despatch. Suitable quality amplifier circuit free with deck. Carriage and Insurance 7/6 extra.

"Motek" recording heads :—

Record/Playback ..... 39/6d.

Erase 39/6d

All correspondence to :

322, High Road, Wood Green, London, N. 22

Callers welcome to :

120, Green Lanes, Palmers Green, London, N.13

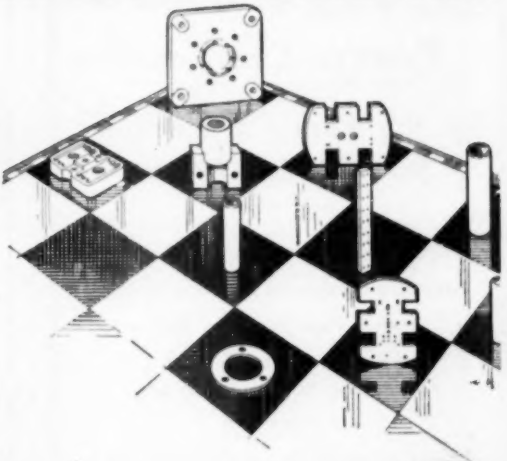
Telephone : BOWes Park 6066. (Near Bowes Road)

Your first move . . . **FOR BETTER INSULATION**

CONSULT

Bullers

Makers of Low Loss Ceramics



Made in Three Principal Materials—

FREQUELEX An insulating material of Low Dielectric Loss, for Coil Formers, Aerial Insulators, Valve Holders, etc.

PERMALEX A High Permittivity Material. For the construction of Condensers of the smallest possible dimensions.

TEMPLEX A Condenser material of medium permittivity. For the construction of Condensers having a constant capacity at all temperatures.

BULLERS LIMITED

6 Laurence Pountney Hill, London, E.C.4. Phone: Mansion House 9971 (3 lines) Grams: "Bullers, Cannon, London"

UNIQUE OFFER OF TECHNICAL GUIDANCE

Such have been the advances made recently in the design of high-fidelity equipment—amplifiers, multi-speed motors, pick-ups, loud-speakers, speaker cabinets, tape-recorders, etc.—coupled with the recent revolution in disc-record manufacture (Long Playing), that music lovers who are anxious to go in for Quality Reproduction or to modernise existing equipment may feel uncertain which of the various makes and models will best suit their needs and existing equipment—and pocket.

WE OFFER TO ALL those thus placed the benefit, free of charge, of EXPERT TECHNICAL ADVICE on the equipment most suited to their needs. Our Chief Engineer is available to callers from 9 a.m. to 5.30 p.m. daily, including Saturdays. IT WILL PAY YOU, from every point of view, to consult us before spending good money on the above items. If you cannot call, please send 2½d for CATALOGUE (and advice if required). We quote a few of our standard lines as follows:

N.R.S. "SYMPHONY" AMPLIFIERS: fitted with the patent "three-channel system" giving independent control of Bass, Middle and Top, thus affording the maximum possible control of tone and compensation for recording deficiencies. Especially essential when mixing the playing of old and new 78s with the new L.P. records. Scratch control and negative-feedback also incorporated. Woden transformers. 5-watt model only **10 gns.** 10-watt model (push-pull triodes), **15 gns.** Carr. 5/-.

MAGNETIC TAPE RECORDERS. We are now pleased to announce that after extensive research, our new, high-fidelity "Symphony" Portable Tape Recorder is in production and delivery is ex-stock. **Price 42 gns.**, details 2½d.

B.S.R. MU10 GRAM MOTOR for 33⅓ or 78 r.p.m., **£3/18/9**; model MU14 as above, but for 33⅓, 45 and 78 instantly switchable, **£4/9/6**. Both motors complete with turntable, rubber mat and fixing screws.

BASS REFLEX CABINET KITS, 30in. high, consist of fully cut, ¾in. thick non-resonant patent manufactured acoustic board, deflector-plate, fole, all screws, etc., and full instructions. 8in. speaker model, 15in. wide x 12in. deep, **85/-**; 10in. speaker model 16in. wide x 13½in. deep, **97/6**; 12in. speaker model 17½in. wide x 16in. deep, **107/6**. Carr. 7/6. Ready built, **7/6** extra.

GARRARD 3-SPEED AUTO-CHANGER, model RC72A WITH NEW TYPE LONG ARM for better tracking and two separate Decca XMS heads (not to be confused with auto-changers with turnover pickup). Price **£19/13/-**. Or fitted with the Acos GP 19 and GP 19LP hi-fi crystal heads, **£18/3/6**. Limited number only.

GARRARD CENTRE-DRIVE GRAM MOTORS for AC mains, high-grade, variable speed, complete with 12in. turntable, 78 r.p.m. Price **£5/17/6**, post 2/-.

COLLARO 3-SPEED AUTOCHANGER, for 33⅓, 45 and 78 r.p.m., plays NINE RECORDS, **£12/8/2**.

COLLARO 3-SPEED MIXER CHANGER **£14/19/2**.

COLLARO PICKUP HEADS to suit above Gram Units and Autochangers: Standard Magnetic, **25/-**; High-Fidelity Magnetic (78 r.p.m. only), **30/7**; GP27 incorporating Acos GP high-fidelity crystal cartridge and permanent sapphire needle (Std., L.P. or Dual Purpose), **48/-**.

DECCA 3-SPEED GRAM UNIT. Model GU4A incorporating selected motor and turntable cushion-mounted on brown crackle unit plate with XMS pickup arm to take latest type 3-pin plug-in pickup heads. Unit supplied with springs for floating metal plate on wooden motorboard. Our special offer: **£8**, or complete with two Decca XMS Heads, **£13/10/-**, or with Acos GP 19 and GP 19LP **£11/15/-**.

ACOS GP29 PICKUPS, with long, white-ivorine arm and either Std. or L.P. head, **£3/11/8**, or with both heads, **£5/14/9**.

CHANCERY SUPER LIGHTWEIGHT PICKUPS. Model GPX with Acos GP crystal insert and permanent sapphire for Std. or L.P., **53/-**, or with both inserts, **84/6**; insert only, **31/6**.

CHANCERY LIGHTWEIGHT PICKUP. Model GP80 with 3-pin plug-in head fitted Acos crystal and permanent sapphire for Std. or L.P., **60/8**, or with both heads, **96/8**. Heads only: **36/-**. Ditto heads but for Garrard and Decca 3-pin arms **36/-**.

COMPLETE RECORD PLAYERS, single-record and autochange. Send for catalogue giving details of our nine different models including all popular combinations of pickup, motor and cabinet.

AC/DC AMPLIFIER, 24 gn. model by Rees Mace, 6 watts push-pull output, volume and tone controls, inputs for Pickup and Microphone, inbuilt screened mike trans., high-class job housed in dove-grey steel case, complete with all leads, brand new and guaranteed. **15 gns.**, carriage 5/-.

RECORD PLAYER CABINETS, 15½in. wide x 13½in. back to front x 6½in. high, ex-manufacturer, motorboard cut for Decca motor, finished in brown rexine with carrying handle and hasps. While they last, only **39/6**. Uncut, extra thick motorboards to fit above cabinets, **7/6**. Post and pack. 2/6.

SPECIAL CABINETS. We are pleased to announce the opening of our own new Cabinet Dept., under the direction of an expert craftsman and can now quote for the making of individual cabinets to suit customers' special requirements and to match any existing furnishing schemes.

NORTHERN RADIO SERVICES

16, Kings College Road, London, N.W.3

Phone: PRImrose 8314

Tubes: Swiss Cottage and Chalk Farm.

Introducing....

Newtec Components
TRADE MARK

for the Radio & Electronic Instrument Industries

Group Boards and Mounting Strips

Miniature Component Mounting System

High Voltage Mounting Strips

Precision Instrument Cases
from Stock or to Specification.

Send for illustrated literature to the Component Division,

JOYCE, LOEBL & CO. LTD.,

Vine Lane, Newcastle upon Tyne, 1

HANNEY of BATH offers

EDDYSTONE 740 RECEIVERS, now available again at **£38/15/-**. Send for free illustrated folder.

THE NEW COLLARO PICKUPS (prices inc. tax). Magnetic for std. records, only **40/-**; G.P.29 Turnover crystal with sapphire needles for **std. & L.P.** records, **80/8**; Orthodynamic with Alloy needles and transformer, for std. and L.P. records, **77/8**.

ACOS G.P.29 pickups, std. or L.P., **71/5**, heads only, **43/4**.

AUTOCHANGERS. Collaro RC521 with magnetic P.U. (std.), **£12**; Collaro 3RC521, 3-speed unmixed with 2 GP 27 Hi-Fi crystal heads, **£17/18/5**; Type 3RC522 as 3RC521 but mixed, **£20/8/4**. B.S.R. Monarch, 2 speed with Hi-Fi turnover crystal pickup with 2 permanent sapphire styli, **£17/17/-**.

GRAM MOTORS. B.S.R. MU 10 2 speed motor, **74/4**; B.S.R. M.U. 14 3 speed motor, **86/8/6**.

TAYLOR MONTROSE MULTIMETER, 50/- (see Taylors advert in Nov. issue "W.W.").

Q-MAX Chassis Cutters, with boy, ½ and ¾ **12/4**; 1 **13/3**; 1.1/4 and 1½, **16/-**; 1¾ **17/9**.

RECTIFIERS. Brimar RM1, **5/-**; RM3, **6/-**; RM3, **7/-**; RM4, **21/-**; S.T. & C. K3/48 (1 mA 9 kV), **8/2**; K3/100 (5 kV), **14/6**; Westinghouse WX3 and WX6, **3/6** each; 14D30, **11/7**; 14A86, **20/4**; 36EHT45, **23/8**; 36EHT80, **28/1**; 3cEHT100, **29/5**.

VIEWMASTER. Stage ONE, **61/-**; TWO **42/9**; THREE, **65/1/8**; FOUR, **9/10**; FIVE, **£10/4/-**; SIX, **£7/5/9**; SEVEN, **58/-**. Coils with L.S. L'don, **21/-**; Wearite, **25/-**; R'ham, U.K.-O.S., **20/-**; Pre-amp., **4/-** pair. Bulgin kit, **15/-**; W.B.100, **19/6**; WB101, **6/-**; WB102, **19/6**; WB103, **48/-**; WB103A, **52/6**; WB104, **15/6**; WB105, **39/6**; WB106, **25/6**; WB107, **32/6**; WB108, **33/6**; WB109, **22/6** (state tube type); WB110, **10/-**; WB111, **5/9**; WB112 12in., **21/6**; WB113 9in., **21/-**; WB300 pre-amp. chassis, **17/6**. W.B. double deck chassis conversion kit, **35/-**.

VIEWMASTER, WIDE ANGLE COMPONENTS. Allen, FO.308, **21/-**; DO.300, **40/-**; GL.16, **10/-**; GL.16, **10/-**; LO.308, **50/-**; FC.302, **35/-**; Bloc F.M. Focus Rings, W25 Mk. II, **57/6**; W22 Mk. II, **52/6**.

SUNDRIES. New H.B. Headphones, **14/9** pr.; 6.3 v. 1.5 amp. fil. trans., **7/6**; Polystyrene varnish, **1/10**; Osmor HO packs, **52/-**; Osmor Q coils, **4/-**; Wavmouth H coils, **3/9**; Wearite P coils, **3/-**; Denco C.T.R.F coils, **8/-** pr.; H.N. T.R.F coils, **15/-** pr. T.R.F coils with reaction, **4/3**; G.E.C. Xstal diodes, **4/-**.

Send 6d. stamp for our comprehensive list now containing details of P.W. 3 speed Autogram, Tapedeck Amplifier, Modern 1 and 2 Valver, High Speed Fault Finder, Williamson Amplifier; Viewmaster, Teleking and General Components. Please add 9d. postage on orders under £1 and 2/- is added to C.O.D. orders under £5. **"YOU ARE SAFE IN DEALING WITH US."**

L. F. HANNEY

77 Lower Bristol Road, Bath. Tel. 3811.

To our friends and customers . . .

To radio engineers and designers . . .

To our suppliers and competitors . . .

To all engaged in the Radio and Television Industry

at home and abroad . . .

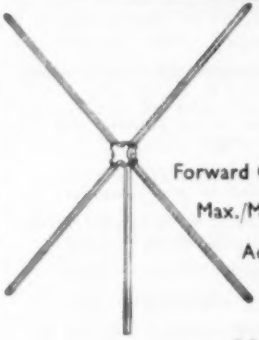
We wish Good Health and Happiness
at Christmas
and Prosperity in Nineteen Fifty-three

REPRODUCERS AND AMPLIFIERS LIMITED
WOLVERHAMPTON ENGLAND

RECEPTION PERFECTION

The New **DUBLEX** TELEVISION AERIAL

The DUBLEX is a new television aerial utilising cross connected folded elements—a unique construction which results in an excellent electrical and mechanical performance. **The forward gain of 6 dB is greater than that obtained with the orthodox type of television aerial construction, and the maximum/minimum ratio of 25 dB is invaluable for interference and "ghost" elimination in difficult reception areas.** Features of the DUBLEX are :—● High forward gain of 6 dB. ● High maximum to minimum ratio of 25 dB. ● Broad bandwidth on both vision and sound. ● Easy to instal in the minimum of time. ● Light in weight yet robust in construction. ● Fully weatherproofed in every detail. The mechanical construction of the DUBLEX is unique with a cast housing retaining four shock absorbing insulators through which the folded elements are assembled.

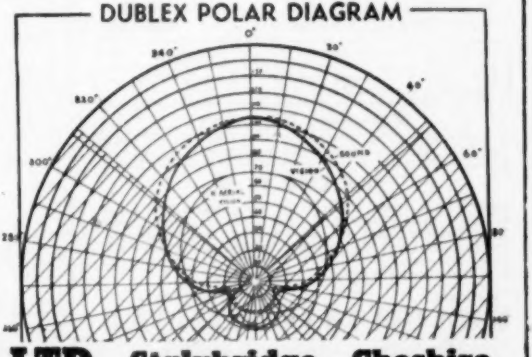


Forward Gain 6 dB.

Max./Min. Ratio 25 dB.

Acceptance Angle 96°.

DUBLEX POLAR DIAGRAM



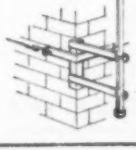
PRICES:

DUBLEX with 7ft. mast, chimney brackets, lashings, etc. Price £4/8/6

DUBLEX (array only). Price £2/14/6

DUBLEX with 10ft. x 2in. alloy mast, double lashings, etc. Price £7/15/-

DUBLEX with 14ft. x 2in. alloy mast, double lashings, etc. Price £8/12/-



AERIALITE LTD. Stalybridge, Cheshire

Immediate delivery-of course

VALVES !! TUBES !!

RECEIVING. TRANSMITTING. MAGNETRONS. KLYSTRONS.
CATHODE-RAY TUBES. PHOTOCELLS. ETC.

First Grade Quality - British and American Make - No Dollar Expenditure Involved

LARGE QUANTITIES & GREAT VARIETIES

S. Szymanski

(pronounced SHE-MAN-SKEE)

ELECTRONIC ENGINEER AND STOCKIST

Office and Stores :

12a LEIGHTON GROVE - LONDON - N.W.5

★ *Telephones :* {GULliver 6077/8 (2 lines) {HENdon 1617 *Telegrams :* {*Overseas :* "Shemanskee" London {*Inland :* "Shemanskee" Norwest London ★

PROBABLY THE LARGEST ACTUAL STOCKIST IN ENGLAND

WHOLESALE AND EXPORT ONLY

BRADMATIC
LIMITED

Bradmaster Model 5 Tape Desk

Two speeds, 3¾ and 7½ I.P.S. Double track. Three heavy duty motors. Fast wind and rewind without unlacing. New type Servo Band Brakes. Push Button Control. Three separately shielded heads. Takes 7 inch 1 200 ft. reels. Dimensions: 13½" x 15½" x 6½" deep.

Price : Fitted with 6RP heads - - **£42 0 0**
Price : Fitted with 5RP heads - - **£41 0 0**

Bradmaster Model 5c Tape Desk

Takes 9½" 2,250ft. reels. Double track. Larger Reel Motors. Programme time: 55 mins. @ 7½ I.P.S. 110 mins. @ 3¾ I.P.S. Dimensions as Model 5.

Price : Fitted with 6RP heads - - **£45 10 0**
Price : Fitted with 5RP heads - - **£44 10 0**

A recorded frequency range of 50-11,000 c.p.s. at 7½ inches per second can be obtained by using a Model 5 Tape Desk with a type A1 recording amplifier utilising a Williamson or similar high quality main amplifier for playback.

Portable Recorders

In rexine-covered case, fitted with model 5 Tape Desk (6RP heads) and C.J.R. type D.1 amplifier with monitoring. Provision for external loudspeaker. Complete with microphone and leads.

Price **£119.15.0**

High Fidelity Sound Heads. Type 5RP (record play) £3/5/0. Type 6RP (Super Fidelity), £3/15/0. Type 5E (Erase), £3/5/0. Scotch Boy, E.M.I. tape, 35/- per reel: G.E.C. tape, 30/- per reel. Gevasonor (Belgian), 35/- per reel. Amplifiers and Microphones Now available: All Mumetal Screening Cans suitable for Bradmatic Heads, 9/6 each.

Trade supplied Send for Lists.

BRADMATIC LIMITED

STATION ROAD · ASTON · BIRMINGHAM 6
Phone : EAST 0574 Grams : Bradmatic, Birmingham

CASH is WAITING FOR YOU

TURN YOUR REDUNDANT AND SURPLUS TEST EQUIPMENT INTO MONEY

We require certain types of English and American equipment in any quantity and any condition, however rough.

We give below examples of prices we pay for equipment in good condition :

- RECEIVER R.54/ARP.4 WITH TUNING UNITS TN.16, TN.17, TN.18 and TN.19. **£110**
- BC.221 FREQUENCY METER. **£25**
- TS.13/AP SIGNAL GENERATOR. **£50**
- KLYSTRONS, TYPE 723/AB. **£2 10 0**

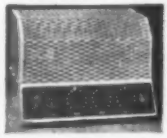
Send for big list of our requirements showing hundreds of items, one of which you may have lying aronnd and which can be turned into money.

Please write, call or phone, giving price, condition, etc.

ELM ELECTRIC CO.

175 Uxbridge Rd., London, W.7
EALING 0779

"LINCOLN" HI-FI AMPLIFIER



A novel arrangement in this amplifier permits connection of output valves as either TRIODES or TETRODES with outputs of 3 or 10 watts. Bass and Treble lift and cut. Negative feedback.
PRICE : 18 Gns.

THE "LINCOLN" TUNER

Three waveband high quality radio unit. 3 positions of selectivity. Maximum bandwidth 18 Kc/s. Gram. pre-amplifier with compensation for L.P.'s and 78's.
PRICE : £15 15/-. (Pur. Tax £7/11/7).

ALL VIEWMASTER COMPONENTS in stock for ALL STATIONS.

"Q-MAX" CHASSIS CUTTERS for cutting holes easily in sheet metal. Sizes from ⅜in. to 2¼in round and 1in. square. Full list on application.

"LINCOLN" SPOOL ADAPTORS
5/9 Each Post 3d.

THE "LINCOLN" OSCILLATOR COIL

Completely enclosed in "Neosid" former ensuring minimum external field. Unusually good waveform with maximum amplitude at 45 Kc/s. Lettered tag panel connections and one-hole fixing.

Overall size, 1⅝in. x 1⅝in. x 1in. PRICE 12/6. (Post 6d.).

"Q-MAX" MODEL G.D.O.1. GRID DIP OSCILLATOR

is an ideal instrument for the determination of tuned circuit resonant frequency, tuning transmitters without application of power, for the determination of coil, mutual and stray inductances and both fixed and stray capacitances. Covers 1.5 to 300 Mc/s in eight ranges. PRICE : **12 Gns.** Complete.

IN STOCK

WILLIAMSON & GARNER AMPLIFIERS.
All components including all precision resistors and condensers, transformers, chokes, etc.

LEAK & ACOUSTICAL
Amplifiers, pre-amplifiers and Tuner units.

BAIRD & CLIFTON
Tape Recorders.

CLIFTON, WEARITE & LINCOLN
Tape Desks.

MICROPHONES
Crystal, Moving Coil and Ribbon in all makes.

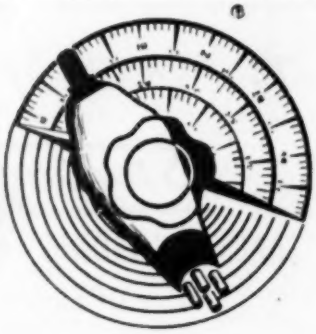
GRAMOPHONE MOTORS
Complete range of single, two and three speed motors and record changers.

TRANSMITTING EQUIPMENT
Everything for the "HAM."

BERRY'S
(SHORT WAVE) LTD.
25 HIGH HOLBORN, LONDON, W.C.1
TEL : HOLBORN 6231

TAPE RECORDING
We can now supply
ALL PARTS
for you to build your
OWN DESK

TECHNICAL BOOK SERVICE
for the Radio Industry



For all your technical books and periodicals you need go no further than the nearest shop or bookstall of W.H.S. Whilst it is not practicable to maintain a big stock of such books at every branch—the Daily Supply Service from Head Office will quickly deliver the books you want to your local branch.

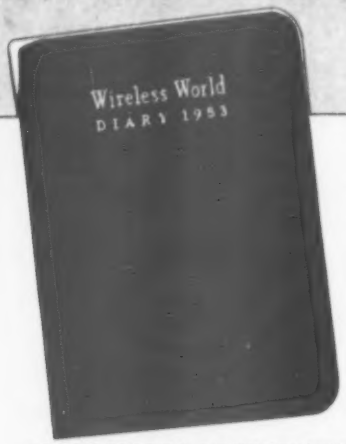
We will gladly supply lists of the standard works on any subject and welcome inquiries from students and librarians.

W. H. Smith & Son
TECHNICAL BOOK SERVICE

HEAD OFFICE: STRAND HOUSE, LONDON, W.C.2

★ Our Postal Service can send technical books and periodicals to any address at Home or Overseas.

Wireless World DIARY 1953



A week-to-an-opening diary *PLUS* 79 pages of valuable information

The reference section provides the kind of technical information so often needed by the radio man, but seldom readily available. It includes circuity; useful formulæ; graphical design data; standard frequency transmissions; valve base connections, etc. **Morocco leather 6s. 1½d. Rexine 4s. 7d.** (inc. P.T.).

FOUNDATIONS OF WIRELESS (5th Ed.)
By M. G. Scroggie, B.Sc., M.I.E.E. Covers the basic theory of radio. Receivers, transmitters, aerials, power supplies and transmission lines are dealt with, and television and radar technique are introduced. **12s. 6d. net.** *By post* 13*s.*

RADIO VALVE DATA (2nd Edition)
Characteristics of 2,000 Receiving Valves and C.R. Tubes. Gives the main electrical characteristics for normal operating conditions. Index enables any valve to be found by type designations. **3s. 6d. net.** *By post* 3*s.* 9*d.*

Obtainable from all booksellers

ILIFFE & SONS LIMITED, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

ASSOCIATED ILIFFE TECHNICAL BOOKS

★ *now ready!* ★

The **Skyway**

TAPE RECORDING MANUAL

COMPLETE BUILDING INSTRUCTIONS *for making a*

De Luxe Tape Recorder

30 pages packed with information, drawings, plans and amplifier wiring diagrams.

PRINTED ON HIGH QUALITY ART PAPER

DIRECT FROM
Frith Radiocraft Ltd.
69-71 CHURCH GATE, LEICESTER

3/6 Plus 3d. Postage

Or through any W. H. SMITH & SON bookstalls

TRANSFORMERS
COILS
CHOKES

TRADE ENQUIRIES INVITED

SPECIALISTS IN
FINE WIRE WINDINGS
MINIATURE DEAF AID TRANSFORMERS, PICK-UP
CLOCK AND INSTRUMENT COILS, ETC.

RADIOMENDERS LTD.
123-5-7 PARCHMORE ROAD, THORNTON HEATH, SURREY
LIVINGSTONE 2261 EST. 1933

PARKER'S SHEET METAL FOLDING MACHINE

Heavy Vice Model · Capacity 18 gauge M.S. x 8" wide · Loose Attachments for Radio Chassis making. Weight 22 lbs Price 42/6 · Attachments 1/6 per ft · Carriage 3/6 · Also Parker's Four in one Revolving Drill Vice. Comprising:- Upright Vee · Inclinable Vee · Right Angle · Flat Side. Admits Stock of 3" dia. Weight 13 lbs Price 42/6. Carriage 3/6

Machines guaranteed. Send for details.

A. B. PARKER WHEATCROFT WORKS, WELLINGTON STREET, BATLEY, YORKSHIRE

RADIO TRADERS LTD.

23 WARDOUR ST., LONDON, W.1.
(Coventry Street end)

Note Phone No. GERrard 3977/8. Grams: "Radiotrade"

WHOLESALE, MANUFACTURERS' AND EXPORT ENQUIRIES ONLY

JONES PLUGS & SOCKETS —4, 6, 8, 10 and 12 WAY

EX. GOVT. CARBON BRUSHES—LARGE STOCKS

RESISTORS

HIGH STABILITY, close tolerances from 1% ½, ¼, 1 and 2 watts. All values up to 2 meg., including 8, 13 and 30 meg.
VITREOUS WIREWOUND. Large selection from 2 to 200 watts.
CARBON. ½ watt to 5 watt. All popular values. Standard Car Suppressors, 15,000 ohms.

CAPACITORS

Block Paper, Silvered Mica, Mica, Tubular and Ceramic.

SWITCHES

TOGGLE, YAXLEY, OAK, ETC.

EPICYCLIC DRIVES

INDICATOR LAMP HOLDERS

Red, Green and Clear.

LAMINATIONS

RADIOMETAL 31, 39 and 40. Also many other types.

VOLUME CONTROLS

MORGANITE "H" type, "LH" type, "M" type and WIRE WOUND. Most values and popular makes in stock.

PLUGS AND SOCKETS

CINCH, PYE, JONES, BELLING & LEE, BULGIN, ETC.

TRIMMERS

Variable CERAMIC TRIMMERS. Capacities from 5 to 100 pf. Spindle and pre-set types. Also Philips trimmers and trimmer tools and many other types.

WIRES

ENAMELLED, SILK COVERED, REG. CELLULOSE and PUSH-BACK. Screened, Standard and P.V.C.

VALVE HOLDERS

Paxolin, Moulded and Ceramic. Large selection including all latest types.

Large selection of

INSTRUMENT & RADIO KNOBS

NUTS, BOLTS, WASHERS, P.K. SCREWS, RIVETS, EYELETS, SOLDER TAGS, GROMMETS, GLASS CARTRIDGE FUSES, BRASS TERMINALS, VARNISHED COTTON AND PLASTIC SLEEVING—various colours ½ mm.—30 mm., ETC. STOCKISTS of all CINCH COMPONENTS.

Many other lines, including ex-government components, in stock. All enquiries dealt with individually, but regret no lists are issued.

TRADE COUNTER OPEN 9.30 to 5.30 MONDAY TO FRIDAY. CALLERS WELCOMED.

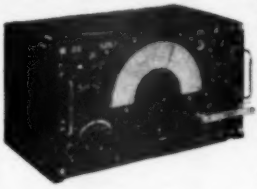
IMMEDIATE DELIVERY

From

OUR LARGE STOCKS

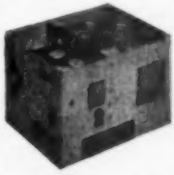
PROMPT ATTENTION

VALUE FOR MONEY OFFERS



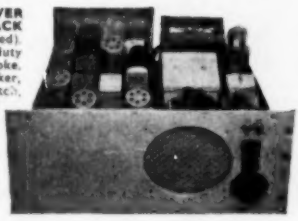
AIR MINISTRY COMMUNICATION RECEIVER R1155A. Brand New in transit cases. Frequency ranges—18.5-7.5 mcs, 7.5-3mcs, 1500-600 kcs, 500-200 kcs, 200-75kcs.
Complete with 9 valves and Magic Eye. Guaranteed absolutely perfect. Price **£9/10** plus 10/- for packing and carriage

1155 POWER PACK AND OUTPUT STAGE complete with U50 and KT61 valves (not surplus) Black crackle case 12 x 8 x 5in. built-in 5in. pm Speaker and phone jack. 200-250v. A.C. All connections terminate in Jones plug which enables instant operation of receiver **without any modifications whatever.** Matches in appearance with receiver. Made to "Wireless World" specification. Built entirely from top grade new components **£7/10** plus 3/6 carriage.



G.E.C. VHF RECEIVERS complete with 10 valves. Ex-Govt. Used but guaranteed in excellent condition. Valves comprise ZA2's 954's or EF50's in HF and 1st Det. stages. Det 19 in local oscillator. KTW63's in three IF stages, D63 Det and AVC, LF H63, Output KT63, Noise suppressor D63, Power requirements 6v 3a, 270v 90ma, as used by various British Police forces. Available in TWO frequency ranges, "B" 95.5-100 mcs and "C" 78.5-82 mcs. Intermediate frequency adjustable 8.3-9.8 mcs. Oscillator Crystal controlled (No crystal included). Sensitivity 3 microvolts for 50mw audio output. Input impedance 72 ohms. Housed in Grey enamel steel case with lid 10 x 8 x 7in. Weight 22lbs. Note the amazingly low price **49/6** plus 5/- carr

THE SAME RECEIVER WITH POWER PACK ("B" or "C" as desired). Incorporating heavy duty mains transformer and choke, U50 rectifier, 6in PM speaker, HT switch, mains switch, circuit breaker, jewel light, output attenuator. Front panel size 19 x 8in front to back 12½in. Weight 60lbs. First-class condition. 5 only remain. Bargain price **6 gns.** plus 12/6 packing and carriage.



JUNCTION BOX. Type 204 Ref. 10A/16002. Length 7¾ x 3 x 3in. 5 4-pin outlets, 2 2-pin outlets, grey enamel. Brand new. Weight 2 lbs. Useful round the shack 2/- each, post 6d. As illus

EDDYSTONE 640 RECEIVERS. 2 only. Absolutely like new. 1.715 mcs to 30 mcs. 230 v. A.C. **£22/10** carriage paid.

LOUD SPEAKERS. Pre Tax stocks. PM Units 6½in. and 8in. **15/-** each. 10in. 19/6 each. Note the extremely low prices. Postage 1/-.

VIEWMASTER. COMPLETE RANGE OF VIEWMASTER PARTS always in stock. Westinghouse Metal rectifiers for the VM have been in short supply. We can now deliver from stock. WX3, WX6, 3/9, 14D36, 11/7, 14A86, 23/8, 36EHT100, 29/4. The Set of 5, **69/-** post paid.

2½d stamped envelope must accompany all enquiries.

H.P. RADIO SERVICES LTD.

Britain's Leading Radio Mail Order House

Estd. 1935

55 COUNTY ROAD, WALTON

LIVERPOOL, 4

Tel.: **Aintree 1445**

ENAMELLED WIRE
(On wooden reels)

S.W.G.	2 oz. Reel	4 oz. Reel
16	1/3	1/10
18	1/3	2/-
20	1/4	2/2
22	1/5	2/4
24	1/6	2/6
26	1/7	2/8
27	1/8	2/9
28	1/8	2/10
30	1/9	3/-
31	1/10	3/1
32	1/10	3/2
33	1/11	3/3
34	1/11	3/4
36	2/-	3/6
38	2/2	3/10
40	2/4	4/2

TINNED COPPER WIRE

S.W.G.	2 oz. Reel	4 oz. Reel
16	1/3	1/10
18	1/5	2/-
20	1/4	2/2
22	1/5	2/5

DOUBLE SILK COVERED WIRE

S.W.G.	2 oz. Reel	4 oz. Reel
16	1/3	1/10
18	1/3	1/11
19	1/5	2/3
20	1/6	2/6
22	1/8	2/10
23	1/9	3/-
24	1/9	3/-
26	1/11	3/4
27	2/-	3/6
28	2/1	3/8
29	2/2	3/10
30	2/3	4/-
31	2/4	4/2
32	2/6	4/6
33	2/9	5/-
34	2/10	5/2
35	3/-	5/6
36	3/2	5/10
38	3/6	6/6
39	3/9	—
40	4/-	7/6
41	2/3	—
42	2/6	—

MILNES H.T. UNITS

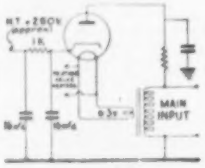
120 volts 60 mA. you charge these from a 6 v. car battery. Price 67/6 each—callers only or carriage at your risk.

SHEET PAXOLIN

Invaluable for when you are experimenting. Size 6in. × 6in., 1/-. Size 12in. × 8in., 2/-. Size 12in. × 12in., 3/6. Size 24in. × 12in., 6/-.

EXCELLENT CHRISTMAS PRESENT

Novelty radio in coloured plastic cabinet only 6in. high, ideal for a nursery or bedroom, 2-gang tuning condenser, volume control and ON/OFF switch, all wired up. Works off dry batteries. Valves required are three of type 1T4 and one of 3S4. Because of a frustrated export order we are able to offer these sets, complete except for valves and speaker, at the remarkable price of 29/6 each, postage and insurance 2/6 extra. Don't delay—send your order to-day.



A POWER PACK FOR 15/-

Efficient power supply, O.K. for operating a receiver, amplifier, instrument or other device requiring up to 60 mA. at approx. 250 v. Parcel consists of filament transformer, rectifying valve, smoothing resistor and 16 × 16 mfd. 350 v. Electrolytic condenser. Note the filament transformer will supply enough current to operate 3 or 4 other 6.3 valves.

VALVEHOLDERS

Type	Paxolin	Amphenol	Ceramic
	s d	s d	s d
British 4-pin	6	—	9
British 5-pin	6	—	9
British 7-pin	6	—	9
British 9-pin	9	—	—
UX 4-pin ..	6	—	1 6
UX 5-pin ..	6	—	9
UX 6-pin ..	7	—	—
UX 7-pin ..	8	—	—
Large UX7	—	—	1 0
Diode B3G	6	8	—
B7G ..	6	8	10
B8G Loctal	9	—	—
B8A	1 3	1 6	—
B9A (Noval)	1 3	—	—
B9G ..	1 0	1 0	—
B12A (Duodecel) ..	1 3	—	—
Int. Octal ..	6	9	1 6
Mazda Octal	6	9	—
8-pin side contact ..	—	2 6	—
Jumbo 4-pin	—	—	3 6
4-pin Hivac	9	—	—
5-pin Hivac	9	—	—
5-contact Acorn ..	—	—	1 6

VALVE SCREENING CANS

	s d
Suitable for standard size valves consists of three parts, bottom plate, main body and spring top ..	1 3
B7G fixing base and top screen with spring ..	1 6
Screen for octal G.T. Valves	6

VALVE RETAINERS

Spring type for EF50 ..	3
Threaded type for EF50 ..	6
General type for all valves, consists of a silk cord and two springs	3

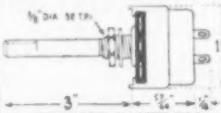
VALVE TOP CONNECTORS

Type	Plain	Scr'ned	Insulated
	s d	s d	s d
British ¼in. top ..	1½	9	1 6
American ¼in. type ..	1½	9	1 6
Screw to clip adaptor (for modern equivalents)			6

SERVICE DATA

100 service sheets, covering British receivers which have been sold in big quantities, and which every service engineer is ultimately bound to meet. The following makers are included: Astrodyne, Alba, Bush, Connor, Ekco, Ever-Ready, Ferguson, Ferranti, G.E.C., H.M.V., Kolster Brandes, Lissen, McMichael, Marconi, Mullard, Murphy, Philco, Philips, Pye, Ultra. Undoubtedly a mine of information invaluable to all who earn their living from radio servicing. Price £1 for the complete folder.

Our folder No. 2 consists of 100 data sheets covering most of the popular American T.R.F. and superhet receivers "all dry," etc., which have been imported into this country. Names include Sparton, Emmerson, Admiral, Crossley, R.C.A., Victor, etc. Each sheet gives circuit diagrams and component values, alignment procedure, etc., etc. Price for the folder of 100 sheets is £1. Post free.



VOLUME CONTROLS

We carry a full range of standard-size volume controls from 2K, to 2 meg. Prices are: less switch, 3/-: Single pole switch, 4/-: double pole switch, 5/-. We can also supply midget-type controls, less switch, 4/-: single pole switch, 5/9: double pole switch, 6/6. Each of these midget controls has a serial number and carries a 12-month guarantee by the makers; they are made on the new moulded track principle and really do perform well.

CARBON RESISTORS

½ or ¼ watt, 4d. each, 3/6 doz.
1 watt, 6d. each, 5/6 doz.

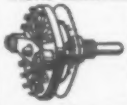
SMALL CONDENSERS

Moulded mica, silver mica, ceramic, paper tubular, all values up to .01 mfd. normal 350 v. working, 6d. each, 5/6 doz.
.01 mfd., 6d. each.
.1 mfd., 9d. each.
.5 mfd., 1/- each.
1 mfd., 1/3 each.

I.F. TRANSFORMERS

465 kc/s iron dust cores fitted in aluminium can size 1¼in. × 1¼in. × 3¼in. Price 12/6 pair.
Midget type, 465 kc/s, size 1¾in. × 1¾in. × ¾in. (M400B) Price 17/6 pair.
465 kc/s.
Ex-equipment in good condition, fitted in standard size can, dust cored. Price 7/6 pair.

WAVE-CHANGE SWITCHES



Of course we stock all popular sizes and types, but special this month is a midget type with long spindle, ideal for coil pack, etc. Price 2/11.

Advertisement by Electronic Precision Equipment Ltd., see overleaf

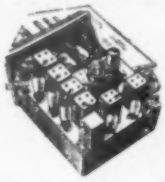
GOVERNMENT SURPLUS EQUIPMENT

RDF1

Ex-Army unit contains 13 valves as follows: 5 of SP61, 2 of P61, 3 of EA50, and CV63, EB34, EC52.
In an article entitled the "£9 Televisor," published in "Practical Television," details are given showing how to make a Televisor using this unit. A reprint of this article is given free to all purchasers. Price 49/6, carriage and packing 5/-.

10-VALVE 1¼-METRE SUPERHET

Ideal for conversion into a Televisor. These contain 6 valves type SP61, and one each RL7, RL16, and EA50. Six IF transformers of 12 Mc/s. band width, and hundreds of other useful components. Price 59/6, plus carriage and packing 7/6. These receivers are unused and in original wrappings.



RF UNIT TYPE 24

Contains 3 valves, SP61 and miscellaneous HF components ideal for conversion for all TV frequencies. Supplied complete with conversion data. Price 25/-.

FULL PICTURE VCR97

We have had a new delivery of this now-famous electrostatic 6in. T.V. tube, these are not the cut-off type, and we guarantee a full picture, 42/6, carriage and insurance, 5/-.

RECEIVER R1124

This receiver contains a host of useful stuff, the most important of which is a coil pack which needs only the adjustment of its trimmers to receive A.P. sound. The valves contained are three type 9D2 and one each of 8D2, 4D1 and 15D2. We understand that these receivers have never been used. Price only 18/6 each, plus 2/6 postage.

TUNING UNITS

American made units, available are TU5B, TU6B, TU9B, TU10B, TU13A, TU17A, TU25A, TU47, TU48, TU49, TU51, TU52, TU54, TU60. All 19/6 each, plus 3/6 carriage.

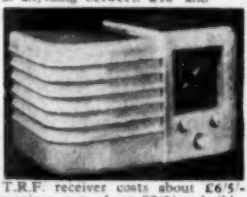
TWO-VOLT ACCUMULATORS

Made for the Forces by one of the most famous firms in the world.
15 amp.-hour size approx. 6in. × 1¾in. square in ebonite case, pre-charged, only need filling with acid, 4/9 each, plus 9d. post and insurance.

GIVE A RADIO YOU HAVE MADE

You will find that the building of our all mains radio receivers is simplicity itself, and the more you make the less time each takes; everything down to the last nut and bolt is supplied and everything fits together in a very professional manner. When finished the receiver looks and plays at well as those being offered in radio shops at anything between £10 and £14. So why not give one as a present to someone dear to you this Christmas.

The one illustrated above we call "The Occasional," in Ivory or Walnut. The T.R.F. cost just over £6 to make, while the superhet costs approximately £9.
The other radio illustrated we call the "White Lady"; this is an extra fine cabinet of pure white. The complete T.R.F. receiver costs about £6/5/- to build, and the superhet receiver costs about £9/5/-to build.



Constructional data for either set is available at 1/6 post free.

IDEAL GENERAL PURPOSE RECEIVER

The Elpreq "Wolsey" 5 valve A.C./D.C. superhet has a built-in aerial and is of convenient size and weight to carry from room to room. Powerful reception on long, medium and short waves—handsome wooden cabinet—illuminated glass dial, with station names A.V.C. and usual refinements. Size 11in. × 5¼in. × 7in. with B.V.A. valves, 12 months' guarantee. Limited quantity only. £9/5/- or £3/2/- deposit and balance over 12 months, carriage and insurance, 5/-.

EXCELLENT CHRISTMAS PRESENT FOR MOTHER OR MARRIED SISTER

The "Lectross" is a convector room heater which can be a clothes drier on washing days. It will make life easier in any home, but is an extra boon in flats and where washing is done in the evening.
We have sold a lot of these, and purchasers have been delighted. In fact many find it difficult to believe we can supply at such a low price. We could not, but for the fact that the "Lectross" manufacturers were forced into bankruptcy by a cancelled export order. We are able to offer these to you at less than half the original price, and only a quarter of what the price would be if they were made to-day. We also bought all the spare parts, so you need have no fears about repairs; in fact, we guarantee always to be able to supply spares.
The size of the "Lectorss" is 3ft. wide, 3ft. high × 5in. deep. It has four chrome plated rails and works off A.C. or D.C. mains, consuming 650 watts, i.e. just less than one unit. Price £4/19/6, plus 7/6 carriage. Please state your mains voltage.

R.1155 FOR £3

This set, as most will know, is considered to be one of the finest communications receivers available to-day. The frequency range is 75 kc/s to 18 Mc/s. It is complete with 10 valves and is fitted in a black metal case. Made for the R.A.F., so obviously a robust receiver which will give years of service. Slightly used but completely overhauled and guaranteed in perfect working order. PRICE £7/19/6 or will be sent against a deposit of £3, balance of 12 monthly payments of 11/6. If you cannot call to collect please include an additional 10/- to cover cost of transit and carriage. This partly returnable to you if and when you return the transit case.

MAINS POWER PACK FOR R.1155

With Pentode output stage. Plugs into socket on receiver so no internal modifications are required. Price £5/10/- complete with 8in. speaker ready to work, carriage 3/6. H.P. Terms £2/4/- deposit and 10 monthly payments of 10/-.

TEMPERATURE CONTROLLED SOLDERING IRON

The Famous Bicobar

These irons have a built-in thermal device which permits quicker warming up, greater available heat for soldering on metal chassis, etc., no burning when idling and finally a saving of current as the wattage reduces when the iron reaches a critical temperature. 250 only available (standard pencil bit type). Please state voltage. Price 15/- plus 1/- post.

TAX FREE

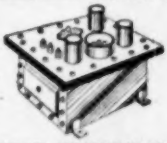
R.M. Extension Speaker in bakelite case with volume control. Price 49/6, but we shall have to pay Tax on future consignments so buy one while you have the chance.

A MILLIBAR BAROMETER

If you are interested in meteorology, or if you think a good barometer would help you to explain some tricky radio problem, then you will be interested to know that an article appeared in one of the leading meteorological journals, showing how the ex-R.A.F. Sensitive Altimeter can become a first-class highly sensitive yet robust aneroid barometer. We offer the sensitive altimeters in good condition with instructions at 17/6 plus 1/- postage

EXTENSION SPEAKER IN METAL CABINET

This has a 6½in. P.M. Goodman's Speaker, heavy magnet type, complete with an output transformer. It is fitted in grey steel case with perforated front and back, ideal for P.A. work in canteens, clubs, etc., 27/6 each.

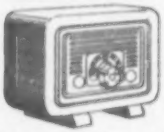


RADAR TRANSFORMER

For pulse work at 4 kV., this is Ministry style No. 224261 Type 2. Oil filled and fitted with two valve holders and ceramic insulators. It contains a pulse transformer, a choke and a filament transformer, all of which are designed to operate on 4 kV. Price £2/10/-.

Advertisement by Electronic Precision Equipment Ltd., see overleaf.

CRYSTAL SET



Two wave, uses latest crystal valve—good results without batteries or mains 18/- or send only 4/6 for crystal valve, you can make the rest, blueprint free.

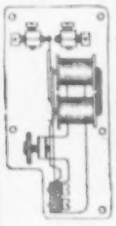
RADIO STETHOSCOPE

A novel device aptly called a Radio Stethoscope is described in a recent edition of the "Radio Constructor" this is compact and can be slipped into the pocket rather like a fountain pen. With it in most districts a receiver can be checked from the grid of the first valve right through to the output without a signal generator, the stethoscope will operate in both L.F. and R.F. circuits without alteration. It is a complete fault finder.

The only parts needed to make the simple circuit tracer are a pair of crocodile clips, a germanium crystal, and a paper tubular condenser and we will supply whole outfit for 6/6, post free, and with each outfit we will give re-print of the article as it appeared in the "Radio Constructor."

NOTE.—If you wish to make it up as a pocket unit then you will need a few other odds and ends, solder tags, etc., from your spares box.

RELAYS



Extra light weight, extra sensitive for high speed or radio control work, weight only 1¼ oz., closes on 2 mA., solid, platinum changeover contacts, adjustable pressure. **Price 13/6.**

CONTACTOR

For breaking 25 amps, coil voltage is 24 v. D.C., but with a re-wind or a small rectifier these will close off A.C. mains. Very heavy duty solid silver Contacts. **Price 3/6.**

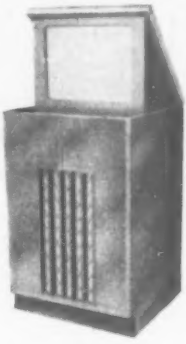
SPRAY GUN

Hand operated, ideal to put a good finish on a completed chassis, and for respraying valves, etc. (completes the perfect job). **Price 15/6** complete with instructions, plus 9d. postage.

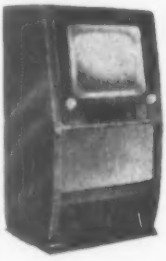
THIS MONTH'S SNIP

Anytime and almost anywhere you can buy cabinets which are value for money, but good resin bonded ply with veneer is very expensive and a high quality finish can only be produced by highly paid, highly skilled labour. Consequently it is seldom that a cheap cabinet is a piece of furniture of which you can be really proud.

However, through the misfortunes of a big manufacturer, we are at the moment able to sell you superior cabinets at low prices. Prices incidentally which are below actual cost. Obviously the quantity is limited and once sold that's the end, so you must act quickly. Call at either Ruislip or Fleet Street or send your order today.



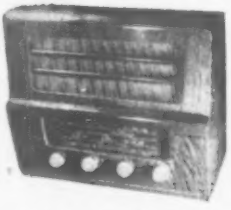
An impressive cabinet designed for projection T.V. but also very suitable for a good quality radiogram or amplifier, Size 23in. wide × 22in. deep. 37½in. high with lid closed.
Price £8/15/- plus 15/- carriage.



A 12 inch console T.V. fitted with castors and front flap for controls. Size 19in. × 35in. × 15½in. deep.
Price £7/10/- plus 10/- carriage.

A sensible radiogram—will take the Collaro 3 speed changer RC511 etc. Size 18in. × 30in. × 11in. to 16in. deep.
Price £7/10/- plus 10/- carriage.

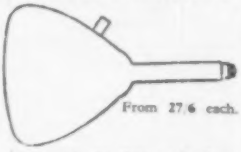
Two very nice radios which will blend with any surroundings.
Size 19½in. × 16½in. × 8½in.
Price 27/6.



Size 17½in. × 15½in. × 6½in.
Price 32/6.

Note. For the radiogram and the two radio cabinets prepared metal chassis, dial, drive and backplate, etc., are being made and should be ready by the time this journal appears. Price 15/- complete.

MAGNETIC T.V. TUBES



From 27/6 each.

All made by first grade firms. They have been slightly used but will probably give years of service. O.K. as a standby or for testing a newly made Televisor.

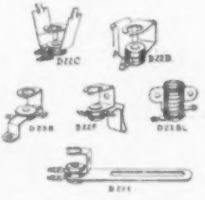
TYPE A. Only fault is low heater to cathode insulation. These will give perfect picture in grid modulated circuits: 9in. £3/15/- each, 12in. £5/15/- each.

TYPE B. Have small ion burns but good cathode to heater insulation. Will be quite suitable in any type circuit: 9in. £2/15/- each, 12in. £3/15/- each.

TYPE C. Have combination of both faults, but will still give reasonably good picture: 9in. £1/17/6 each, 12in. £2/15/- each. If not calling please add 7/6 each tube for packing and postage.

LAMP HOLDERS

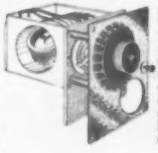
We carry a large assortment of dial lamp holders. Price 6d. each. Order by list numbers.



VACUUM THERMOCOUPLE

Of interest especially to scholastic establishments and available at a very low price is vacuum thermocouple made originally for the Government. Unused, fitted with standard Octal base, Type No. WY2232, regret no other details available. Price 5/-, 54/- doz.

VARIOMETER ASSEMBLY



As illustrated this is useful for experimental circuits, crystal sets, etc. **Price 3/9 each.**

TRANSFORMER SNIP

A Universal replacement by a very famous maker. Standard mains input. Secondaries: 300-0-300 at 80mA. 6.3 v. tapped at 4 v. 4 amp and 4 v. at 3 amps. Note this is a half shrouded drop through type. Price 16/6, plus 1/- post.

Advertisement of Electronic Precision Equipment Ltd.

THIS YEAR'S SNIP

★ 15" TELEVISION TUBE AT APPROXIMATELY HALF PRICE I.E. £12.10.0. (Plus 10/- carriage and insurance.)
★ NOT EX-GOVERNMENT BUT A STANDARD PICTURE TUBE AS USED IN MANY COMMERCIAL RECEIVERS.
★ STANDARD 50° DEFLECTION SO NO SPECIAL WIDE ANGLE COMPONENTS REQUIRED.
★ PRE-TESTED AND WITH WRITTEN GUARANTEE.

TECHNICAL DATA. Blue/white screen tricde for ion trap working — heater 6.3v. .55amp. Anode 9-10KV. 400 microamps — grid — 35v. clip fitting base.

BRAND NEW & IN ORIGINAL BOXES

WIN £100

We know that most of the readers of our advertising pages are clever at designing as well as at making. We feel sure too that plenty of such readers will be turning the long evenings to good use by designing and making television sets using the above 15in. tube.
Now we have big stocks of obsolete ex-Government valves consisting of :— Thyratrons which should be suitable for time base work, power valves for line output and sound, H.F. valves, double triodes, germanium diodes etc., for other circuits, all are available at around 4/- each. We also have resistors at 3/- doz., condensers at 3/- doz., valve holders at 3/- doz., etc., etc. So if whilst you are making your T.V. set using our 15in. tube you can also use some of the valves and parts, and you can further design the coils, etc., then you will stand a chance of winning £100, for this is the amount we will pay for the best design of a complete 15in. 5 channel Television set costing around £30. and using our parts.

CONDITIONS

1. Designs must reach us by December 31st next.
2. Prototype must be available by the same date and if required must be sent to us for judging.
3. If you win the £100 then your prototype will be kept but you will be paid for it at cost.

WHAT TO DO FIRST

If you decide to "have a go" for this £100 prize then send right away for leaflet "December Comp." this gives details of valves etc., together with all the technical information we have about them. You will then order the valves and parts you think best to use. You will, of course, have to pay for all you order but any parts you find unusable if returned in good condition will be taken back and a full refund given. Further to encourage all the readers who whilst not needing a Television set themselves would nevertheless like to try for the £100 prize we are prepared to buy back at full component cost any completed televisors in good working order.

ELECTRONIC PRECISION EQUIPMENT LTD.

The building you see alongside is our new Mail Order Depot at Harrow. We hope to move into these premises early in November but we have had many setbacks already therefore until further notice we request you to address Post Orders to E.P.E. Ltd. (Dept. 2), Windmill Hill, Ruislip, Middx. Personal shoppers please call at :—

42-46 WINDMILL HILL, RUISLIP, MIDDX.
(Half-day, Wednesday).

152-153 FLEET STREET, E.C.4.
(Half-day, Saturday).

UNIVERSITY RADIO LTD.

Offer Guaranteed Used Equipment at Attractive Prices

SPECIAL OFFER :

High Frequency Neon Supply Units by Dawes. Instruments in portable oak case, each comprising High Frequency Oscillator in special circuit using 2 K.T 66's. Can be converted to photoflash unit or used as E.H.T. supply with addition of Rectifier. Complete with H.T. leads and all valves absolutely as new. A.C. mains 200/250 volts. £4.10.-.

Pye Television Signal Generator, Model No. 940226, fitted with Piston Attenuator, Coverage 40-70 Mc/s. as new £35 0 0

Romac 25-watt Amplifier, with inputs for mic. and gram., 200/250 volts A.C. mains, as new £14 10 0

Large Selection Record Players in cabinets, from £6 0 0

Hunts Resistance Capacity Bridge, Model C.R.B., perfect and as new £10 10 0

Avo Model 40, as new £12 10 0

Avo Valve Testers, 1948/9, as new £12 0 0

Taylor 65.B Signal Generator, as new £9 10 0

Eddystone 640 Receiver, complete with valves, perfect and as new £32 0 0

B.S.R. Disc Recording Amplifier, Type AR.15, in portable metal case, as new £38 10 0

Labgear Electronic Fault Tracer, 1950 model, incorporating signal and generator capacity bridge, as new £15 0 0

WORLD FAMOUS FIRM

extending their Laboratories HAVE COMMISSIONED US TO PURCHASE ON THEIR BEHALF 1st CLASS USED BRITISH & AMERICAN TEST EQUIPMENT of all types. Speakers, Sig. Generators, Freq. meters, Test meters etc., etc.

WE CAN PAY YOU THE BEST PRICES.

Advance B.J.C. Signal Generator, as new £15 0 0

MCR-1, complete with power pack, phones, etc., as new £8 0 0

E.D.C. Rotary Converter, 200-250 volt D.C. to 200-250 volt A.C. 1 Ph., 50 Cy., 110 watts, in metal case, as new £9 10 0

H.R.O. Coils in stock £1 15 0

A.R.77 Receiver, first-class condition, 1 only £27 10 0

Western E.772, 1,000 o.p.v., A.C. D.C. Test Meter, in portable case, first-class cond. £11 10 0

Vitavox Bi-tone, in first class condition, cost £60. Our price £37 10 0

E.D.C. Rotary Converter, 200-250 v. D.C. to 200-250 A.C. 1 phase 300 watts. Special model for Television as new, complete in metal cabinet with filter unit £30 0 0

As above, 200 watts £25 0 0

Panoramic Adaptors, either 5 Mc/s. or 455 Kc/s. as new £30 0 0

Connoisseur Gramophone Amplifier, 12 watts output in brand new condition £18 0 0

358X Receiver, with all coils and power pack in first class condition £19 10 0

Valradio Converters, D.C. to A.C., 100 watt £8 10 0
200 watt £10 0 0
300 watt £12 0 0
All the above overhauled by the makers.

Avo Wide Range Signal Generator, as new £21 0 0

★ We urgently need good used test equipment and sound equipment for which we pay highest cash prices

THESE ITEMS ARE ONLY A SMALL SELECTION FROM OUR STOCK OF EQUIPMENT. YOUR ENQUIRIES FOR ANYTHING THAT YOU MAY NEED WILL BE WELCOME. WE HAVE OTHER EQUIPMENT ARRIVING DAILY!

CASH OR CHEQUE WITH ORDERS. ALL ITEMS LISTED ARE CARRIAGE EXTRA. S.A.E. PLEASE

22 LISLE STREET, LEICESTER SQUARE, LONDON, W.C.2

OUR BRANCH AT 39a (opposite) IS OPEN ALL DAY THURSDAY.

Phone : GERrard 4447, 8582 and 5507. Hours 9 to 6. Thursdays 9 to 1.

ASK ARTHURS FIRST

Send your enquiries for all Radio and Electrical goods, especially those in short supply.

★ **NEW VALVES**

We have probably the largest stock of valves in the country. Let us know your requirements.

AVO METERS IN STOCK

Avo Model 7 ..... £19 10 0
Avo Model 8 ..... £23 10 0
Electronic Tester £19 10 0
Valve Characteristic Meter £60 0 0
★**Cossor Oscilloscopes Models 1035 ... £93 10 0**
1049 ... £132 0 0
" " " Also full range Taylors Meters. List on request.

VALVE MANUALS

Mullard 5 0
Osram 5 0
Brimar No. 4 ..... 5 0
Mazda, Parts 1 and 2, each 2 0
Mullard Valve Replacement Guide 2 6
Postage 6d. extra.

Leak Point 1 Amplifiers £38 7 0
Leak Pre-Amplifiers £9 9 0
Leak Tuning Unit £38 5 0
Some Loudspeakers still at Pre-Tax prices. Woden output transformers for Williamson Amplifier £6 12 0
Woden Choke P.C.F. 12 £2 4 0
Wright & Weaire Tape Deck £35 0 0
Qualtape Deck £16 16 0
Recording Tapes : E.M.I., G.E.C. and Scotch Boy, 35/- each.
Terms C.O.D. or Cash with order. Goods offered subject to being unsold and to price alteration.

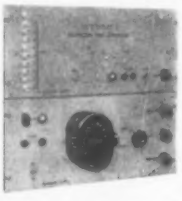
Arthurs EST. 1919

PROPS: ARTHUR GRAY, LTD.

GRAY HOUSE, 150-152, CHARING CROSS ROAD, LONDON, W.C.2
TEMple Bar 5833/4 and 4765. Cables : TELEGRAY, LONDON

RAINBOW Radio Television

CUSTOM BUILT MULTI-OUTLET T.V. PRE-AMPLIFIER



units now available to Aerial Manufacturers, Local Authorities and Contractors. Performance to specification, and with automatic switching if required. Please write for further Particulars.

RAINBOW RADIO MFG. Co. Ltd., Mincing Lane, Blackburn, Lancs.

Specialists in all types of T.V. Pre-Amplifiers, etc.

A MINIATURE MAGNETIC LIGHTWEIGHT EARPHONE

The new Amplivox E.4 Earphone has been primarily developed for use with office dictating machines, industrial equipments and hearing aids where a highly sensitive, lightweight, miniature receiver is needed.

Available in D.C. resistances 2-2000 ohms ; frequency 100-4000 c.p.s. ; diameter .835" depth .420" ; weight ½ oz.

AMPLIVOX LTD.
2 Bentinck Street, London, W.1

MAINS TRANSFORMERS

All 200-250 volts c.p.s. primary. Finest quality, fully guaranteed.
MBA/3. 350-0-350 v. 80 mA, 6.3 v. 4 a., 5 v. 2 a. Both filaments tapped at 4 volts. An ideal replacement trans. Price **18/-**
MBA/5. 350-0-350 v. 125 mA, 6.3 v. 4 a., 5 v. 3 a. With mains tapping board. Price **27/6**
MBA/6. 350-0-350 v. 100 mA, 6.3 v. 3 a., 5 v. 2 a. With mains tapping board. Price **22/6**
MBA/7. 250-0-250 v. 80 mA., 6.3 v. 3 a., 5 v. 2 a. Both filaments tapped at 4 volts. Price **18/-**
AT/3. Auto transformer. 0-10-120, 200-230-240 volts, 100 watt. Price **17/6**
AT/4. Auto transformer. 100 volts and 230 volts. Step up or down. 60 watts. Price **9/6**

METAL RECTIFIERS

6 v. 1 a.	6/9
6 v. 4 a.	17/6
12 v. ½ a.	3/11
12 v. 1 a.	8/6
12 v. 4 a.	17/6

"HAYNES" radio and television components. A large range available from stock. Send us your requirements.

TEST PRODS. Fused, with fully retractable points. Price 4/11 per pair.

SUPERHET COIL PACKS. 3 Wavebands: 12-35 metres; 35-100 metres; 200-550 metres. Size: 4 × 4 × 3in. Price **16/-**.

RF.25 UNITS. BRAND NEW AND UNUSED. For use with 1355 Receiver. Supplied with 3 new SP61 valves. **25/-**. Carriage 2/6 extra.

TWO-GANG TUNING CONDENSERS .0005MFD.

No. 1. Miniature. With Perspex dust cover and trimmers. Size: 1¼ × 2 × 1¼in. ¼in. spindle
LASKY'S PRICE **8/6**

No. 2. Midget. With trimmers. Size: 2¼ × 1¾ × 1¼in., ¼in. spindle.
LASKY'S PRICE **8/6**

No. 3. Midget. With one trimmer. Size: 2¼in. × 1¼in. × 1¼in. ¼in. Spindle.
LASKY'S PRICE **7/6**

No. 4. Standard type. Size: 2½ × 2¼ × 1¼in., ¼in. spindle.
LASKY'S PRICE **6/6**

THREE - GANG TUNING CONDENSER. .0005 mfd. Size 3½ × 2¼ × 1¼in., ¼in. spindle.
LASKY'S PRICE **7/6**

MICROPHONE STANDS.
Table model. 2 section. Chrome plated. Crackle finished base. **19/6.**
Floor model. 2 Section. Brass, heavily chrome plated. **89/6.** Carriage **2/6** extra.

TRIMMERS AND PADDERS

All values up to 100 pF. Panolin **6d.** each, **5/-** per doz. Ceramic **9d.** each, **7/6** per doz. 350 pF and 550 pF. **1/-** each, **10/6** per doz.

A Large range of Garrard and Collaro Auto Changers in stock. For immediate delivery.
Single-speed Garrard. From **£8/19/6**
3-speed Garrard. From **£12/19/6**

P.M. LOUDSPEAKERS

All less o'trans. new and unused. First quality.

3in.	12/11
5in.	12/6
6½in.	13/6
8in.	15/-
10in.	25/-
12in.	75/-

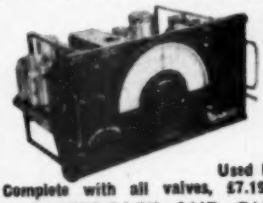
CARBON POT METERS

All with long spindle, ½, ¼, 1 and 2 meg.
LASKY'S PRICE 3/3 less switch, each.
With switch 4/3 each. All post extra.

SPECIAL OFFER

BRAND NEW AND UNUSED R1155 RECEIVERS
AERIAL TESTED BEFORE DESPATCH
THESE SETS ARE THE TOPS

Supplied complete with 10 valves. Circuit: B.F.O., A.V.C., R.F. Amp., two I.F. Stages, magic eye, etc., etc. 5 Frequency ranges: 18.5-7.5 Mc/s.; 7.5-3.0 Mc/s.: 1, 500-600 Kc/s.; 500-200 Kc/s.; 200-75 Kc/s.



LASKY'S PRICE
£11 . 19 . 6
Carriage 12/6 extra

Used Models. Aerial Tested.
Complete with all valves, £7.19.6. Carriage extra.

POWER PACK AND OUTPUT STAGE.
Fully assembled. For use with above receiver. Complete with valves, wired and working. For operation on 200-250 volts 50 c.p.s.
LASKY'S PRICE 79/6 carriage 5/- extra.
IF PURCHASED WITH R1155.

INTER-COM. SETS

4-station operation. For use on A.C./D.C. mains 200-250 volts. Supplied complete, with 3 new valves, ready for immediate installation.
Fitted in pleasant plastic cabinet

MASTER UNIT £7.15.0. Carr. 5/- extra.

Extension Units. As Illustrated. **£1/1/-.** Carriage 2/- each extra.

ROTHERMEL (DEAF AID) XTAL MICROPHONES.
Diaphragm driven. Extremely sensitive, can be used for tape recording, etc.
LASKY'S PRICE 7/6
POST FREE.

TAPE RECORDING.
Oscillator coils, **6/9.** Record/playback head, **39/6.** Erase head. **39/6.** Tape. All 1,200ft. G.E.C., **30/-** per reel. "Scotch Boy," **35/-** per reel. E.M.I., **35/-** per reel.

A very large selection of metal rectifiers is available from stock, at less than half price. Too numerous to mention, send us your requirements.

WEARITE TYPE 550 I.F. TRANSFORMERS. Permeability tuned. 445-520 Kc/s. Size: 3½in. high, 1¾in. square. **Price 12/6**, per pair.

MIDGET YAXLEY SWITCHES. 4 pole 3 way and 2 pole 5 way. Long spind'e. **Price 2/11** each.

P.A. SPEAKERS. Re-entrant horn, 10 watts, beam projector, weatherproof speakers. 15 ohm impedance. Horn diameter—14in.
LASKY'S PRICE **99/6**
Spigot mounting 10/- extra. Carriage and packing 15/- each.

TANNOY PRESSURE UNITS. 10 watts. 7.5 ohms impedance.
LASKY'S PRICE **89/6**
Carriage 4/6 extra.

EXTENSION SPEAKERS. 3in. P.M. Complete with cabinet. Medium walnut veneer. Modern and pleasing design. Ideal for radio extension and intercom. slave units. Fitted with back. **PRICE 21/-.** Postage 2/- extra.

AMPLIFIERS. All fully wired and assembled, ready for operation.
25 Watt Model. By Romac, with radio tuner, long and medium wave. 7 valves, including 2 6L6 in push-pull. Provision for high and low impedance microphone. Absolutely perfect, new and unused. For 200-250 volts 50 c.p.s. mains **£25.**
Model JRA/2. 10-12 watt 4 valves, including 2 KT61 in push-pull. Brand new and unused. For 200-250 volts 50 c.p.s. mains. Details available on request. **£7/19/6.**
12 Watt Model. 10 valves, including 2 25L6 in push-pull. Brand new and unused. For 200-250 volts 50 c.p.s. mains. **£10/19/6.**

LASKY'S RADIO

Lasky's (Harrow Road) Ltd.,

370 HARROW ROAD, PADDINGTON, LONDON, W.9
(Opposite Paddington Hospital) *Telephones*: CUNningham 1979 and 7214

MAIL ORDER AND DESPATCH DEPARTMENTS, 485/487 HARROW ROAD, PADDINGTON, LONDON, W.10
Telephone: LADbroke 4075

Hours: Mon. to Sat. 9.30 a.m. to 6 p.m., Thurs. half day 1 p.m. TERMS: Pro forma, Cash With Order or C.O.D. on post items only. Postage and packing on orders value £1—1/- extra: £5—2/- extra: £10—3/6 extra. Over £10 carriage free, unless specifically stated otherwise.

LASKY'S RADIO

Established Pioneer Radio Specialists

SPEAKER FRET

Expanded metal. Finished silver.

12in. × 12in.	3/11
12in. × 16in.	5/11

Plastic. Finished bronze or cream.

12in. × 5in.	2/-
12in. × 6½in.	2/9
12in. × 16in.	6/6

SMOOTHING CHOKES

20 mA 40 H	3/11
40 mA 8 H	3/11
40 mA 10 H	4/3
100 mA 10-20 H	7/3
150 mA 3 H	3/6
250 mA 10 H	19/6

OUTPUT TRANSFORMERS

40 mA. Multi ratio	6/11
80 mA. Multi ratio	14/11
80 mA. Pentode	12/6
60 mA. Plessey, 6,000 ohms	5/11
Standard pentode	4/11
Pentode	3/6
Midget pentode	4/3
Miniature pentode. 354, 154	4/6
PX4 Intervalve	8/6
5 : 1 Intervalve	5/11

DE LUXE TELEVISION CABINETS

For 12in. cathode ray tubes. Beautiful figured medium walnut finish, with high polish. Fitted with shelf for receiver, glass speaker baffle and fret, and castors for easy movement. Undrilled. Suitable for use with the Viewmaster, "Practical Television," "Practical Wireless," and "Wireless World" televisors.

LASKY'S PRICE £8.10.0

Carriage 12/6 extra.

Outside dimensions of cabinet: 17½in. × 16½in. × 32in. **Why not convert your table receiver to a console?** Adaptor frames for fitting 9in. or 10in. C.R. tubes available if required.

This cabinet can also be supplied cut out for a 16" c.r. tube.

CONDENSERS

ELECTROLYTICS

32+32 mfd. 350 v.w. and 25 mfd. 25 v.w. in single aluminium can.

Latest fixing, **4/11** each.

8 mfd. 450 v.w.	2/3
8 mfd. 500 v.w.	2/11
16 mfd. 350 v.w.	2/6
16 mfd. 500 v.w.	3/6
32 mfd. 275 v.w.	2/6
50 mfd. 350 v.w.	3/11
60 mfd. 350 v.w.	3/11
250 mfd. 12 v.w.	2/-
250 mfd. 350 v.w.	4/11
8+8 mfd. 450 v.w.	4/6
8+16 mfd. 500 v.w.	5/3
12+12 mfd. 350 v.w.	3/6
16+16 mfd. 500 v.w.	4/6
16+24 mfd. 450 v.w.	5/11
32+32 mfd. 150 v.w.	2/6
32+100 mfd. 450 v.w.	7/6
60+100 mfd. 350 v.w.	9/6

BIAS

25 mfd. 25 v.w.	1/6
50 mfd. 12 v.w.	1/6
50 mfd. 50 v.w.	1/6
75 mfd. 12 v.w.	1/-

MINIATURE BIAS

10 mfd. 25 v.w., **10½d.** each, **9/-** doz.

TUBULAR WAXED CARDBOARD

500 v.w. .1, .01, .02, .05, .001, .002, .005, etc., etc., **6d.** each, **5/-** doz.

MINIATURE MICA

100, 200, 300, 500 PF, etc., **6d.** each, **5/-** doz.

CERAMIC AND SILVER MICA

All values from **4½d.** each, **4/-** doz.

MINIATURE

.1, .01, .001, .02, .002 mfd. etc., **7½d.** each, **6/-** doz.

T.C.C. VISCONOL HIGH VOLTAGE CONDENSERS

(Cathodray).

.001 mfd. 12.5 kV.	7/6.
.001 mfd. 15 kV.	10/-.
.001 mfd. 25 kV.	18/-.
.0005 mfd. 25 kV.	18/-.
.0005 mfd. 12.5 kV.	10/-.
.1 mfd. 7 kV.	20/-.
0.04 mfd. 12.5 kV.	7/6.

Plastic case, single bolt fixing.

CRYSTAL DIODES

G.E.C. type, Glass wire ends 3/9 each. B.T.H. Type, Plastic, 3/- each.

VALVE SCREEN CANS

For button base valves. **1/3** each.

For octal valves. **1/3** each.

BULGIN SWITCHES

D.P.D.T. Change over	2/6
S.P. On/Off	1/6
S.P.D.T. On/Off	1/-

INDICATOR UNITS TYPE 233.

Contains 1 c.r. tube type VCR97, and 11 valves :—3 EF50; 3 EB34; 3 SP61; 2 EA50. Also hundreds of various types of components, resistances, switches, etc., etc. Assembled on strong metal chassis, in grey enamel steel case. Size :— 18 x 8 x 8ins. **LASKY'S PRICE 89/6.** Carriage and packing 10/6 extra.

CO-AXIAL CABLE 70-80 ohms impedance. Single core, 9/- doz. yards. Twin core, 12/- doz. yards. Balanced twin feeder, 6/- doz. yards.

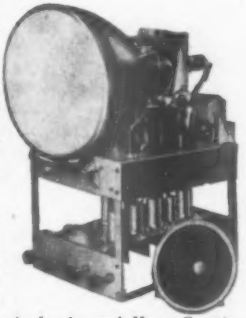
FILAMENT TRANSFORMERS

All 200-250 v. 50 c.p.s. primary.

6.3 v. 1.5 a.	7/11
6.3 v. 3 a.	12/6
6.3 v. 4 a.	14/6
2 v. 2 a.	4/11

Special Transformer. 30 volts at 2 amps., with the following tappings :—3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24 and 30 volts, 17/6.

THE VIEWMASTER



The television set you can build at home from standard parts.

Wenvoe, Kirk o'Shotts, Holme Moss, Sutton Coldfield and Alexandra Palace operation. Brilliant high definition black and white picture.

Superb reproduction.

Uses 9in. or 12in. Cathode Ray Tube. Table or Console Model.

Incorporates all the latest developments.

Television for the home constructor at its finest.

Send to-day for the CONSTRUCTION ENVELOPE. 32-page booklet crammed with top-rate information and all the necessary data, also 8 full-size working drawings and stage by stage wiring instructions. Model "A" for use in London and Home Counties. Model "B" for use in Sutton Coldfield Area. Model "C" for Holme Moss. Model "D" for Kirk o'Shotts. Model "E" for Wenvoe.

PRICE Post free **7/6** per copy.

METAL RECTIFIERS

WX3 and 6. Each	3/9
14D36	11/8
14A86	20/4
36EHT45	23/8
36EHT50	26/1
36EHT100	29/6

SUNDRIES

Morganite resistances London	36/3
All other models	35/3
Bulgin components	13/2
Colvern pot/meters, Type CLR901, 3/2 each	
Type CLR4089/22, 6/4 each	
Morganite type "Q" pot/meters, 5/- each	
Belling-Lee L707 and fuses	9/9

W/B & PLESSEY

Line EHT trans.	32/6
Frame trans.	25/6
3 Mcs boost choke	5/9
Width control	10/-
Scanning coil	33/3
Main choke	15/6
Focus ring	22/6
Heater trans.: WB/103	42/-
WB/103A	52/6
Front and rear C.R.T. supports	21/6

COILS

All models available including filter chokes. Wenvoe, Kirk o'Shotts, Holme Moss, Sutton Coldfield, 28/- per set. Alexandra Palace, 20/- per set. L9 RF choke, 2/-.

CHASSIS

Sound-Vision, 18/6. Power-Pack/Time base, 18/6. Support for S.V. chassis, 6/-.

CONDENSERS

All by T.C.C.

100 mfd. CE10LE,	14/-
250 mfd. CE10DA,	10/-
2,500 mfd. 3 v.w. CE25AA	6/9

All other types in stock.

VALVES

EF50, 8/6 and 12/6 each; EBC33, 12/6; KT61, 12/10; 6P25 15/10; 6K25, 15/1; 6P28, 25/1; EB92, 10/6; EY51, 16/6.

CATHODE RAY TUBES

New and unused, fully guaranteed. All makes available from stock for immediate delivery. 9" from **£13.13.8**, 10" from **£15.4.0**, 12" from **£18.4.10**

Carriage and insurance extra.

Let us have your requirements.

ALL COMPONENTS IN STOCK AND SOLD SEPARATELY.

LASKY'S

Lasky's (Harr

370 HARROW ROAD, PA

(Opposite Paddington Hospital) Tele

MAIL ORDER & DESPATCH DEPARTMENT, 485/487

Hours: Mon. to Sat. 9.30 a.m. to 6 p.m., Thurs. half day 1 p.m.

Larger Screen T.V. new Wide Angle Components and Picture Tubes

CIRCUIT DETAILS AND DIAGRAMS SUPPLIED.

14in. rectangular C.R. tube	£22	8	5
17in. rectangular C.R. tube	£26	19	8
16in. round, metal cone ion trap tube	£24	6	5

Carriage and insurance extra.

ALLEN WIDE ANGLE COMPONENTS

Line and frame scan coils. Type DC300	£2	2	0
Width coil. Type GL18		10	0
Line linearity coil. Type GL16		10	0
Focus coil. Type FC302	£1	15	0
Line output and EHT transformer, 10-16 kV. Type L308	£2	10	0
Frame output transformer. Type FO305	£1	1	0
Frame Blocking Osc. Transformer		15	0

ELAC P.M. FOCUS MAGNETS :—

For 14in. and 16in. Tetrode tubes	£2	12	6
For 14in. and 17in. Triode tubes	£2	17	6

CONVERT YOUR VIEWMASTER TELEVISION RECEIVER TO USE THE LATEST WIDE ANGLE 14, 16 or 17-inch. CATHODE RAY TUBE.

CATHODE RAY TUBE, MASK, VALVES AND ALL OTHER NECESSARY COMPONENTS CAN BE SUPPLIED FROM STOCK FOR IMMEDIATE DELIVERY.

WRITE FOR QUOTATION.

C.R.T. MASKS. Brand new LATEST ASPECT RATIO

10in.	7/6
12in.	15/-
12in. flat face	15/-
14in. rectangular	21/-
15in. round	25/-
17in. rectangular	24/-

SOILED OLD ASPECT RATIO

9in.	5/-
12in.	7/6
15in.	10/-
12in. with fitted armour plate glass (new ratio)	11/6

ARMOUR PLATE GLASS

15in. Actual size 18¼in. x 19¼in. x ⅛in.	7/11
12in. Actual size 13in. x 10¼in. x ⅛in.	4/-
9in. Actual size 9in. x 8in. x ⅛in.	3/-

Multi-Ratio Frame Output Transformer, 10/6.

Frame Blocking Oscillator Transformer, 4/6.

Line EHT Transformer, with EY51 heater winding, 12/6.

Focus Magnet. With Vernier Control. For any type c.r. tube with 35 mm. diam. neck, 21/6.

Scanning Coils. High impedance frame, low line, 12/6. Low impedance line and frame, 14/6. Plessey. Low impedance line and frame, 25/-.

Variable Inductance Width Control, 3/6.

TELEVISION SELENIUM RECTIFIERS

The very latest "Sentercell" S.T.C. range.

K3/40, 3.2 kV	7/6
K3/45, 3.6 kV	8/2
K3/50, 4.0 kV	8/8
K3/100, 8.0 kV	14/8
K3/160, 12.8 kV	21/6

S.T.C. METAL RECTIFIERS

RM1	3/11
RM2	4/6
RM4	18/-

C.R.T. REAR END PROTECTORS

Suitable for fitting to T.V. cabinets, 2/6 each.

CLOSED FIELD LOUDSPEAKERS

Ideal for television receivers. Less o/trans. 3 ohms. Will not affect your C.R. tube.

6½in.	15/-
8in.	17/6

Introducing the

TELE-KING

laboratory developed

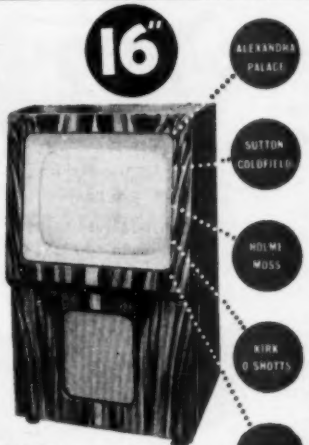
A practical 5-channel

SUPERHET TELEVISION RECEIVER

Using the new 16-inch cathode ray tubes and wide angle components for the home constructor.

Complete instructions, wiring diagrams and 32-page descriptive booklet.

6/- POST FREE



CHASSIS

Power pack, Sound-vision and Scan chassis. PRICE 16/- each.

All other metalwork available from stock.

COILS

13 All exactly as specified. PRICE £2/14/3.

RESISTANCES

72 Resistances, all exactly as specified, 18/-.

A fully itemised price list of Tele-King components will be supplied free on request.

All Tele-King components now in stock, available for immediate delivery.

SOLON-HENLEY ELECTRIC SOLDERING IRONS

Brand new and unused. Oval Bit. For 230/250 volts only.

LASKY'S PRICE **19/-**

Postage 1/- extra.

TELEVISION PRE-AMPLIFIERS

For London frequency. 2 Stage, uses 2 6F13 valves. Completely wired, ready for use.

LASKY'S PRICE **15/-**

(less valves)

LARGE STOCKS of RESISTANCES ALWAYS AVAILABLE

All values. Prices: 1/10th and 1/8th watt, 7½d. each. ¼ and ½ watt, 4d. each. 1 watt, 8d. each. Postage extra.

VCR97 C.R. TUBES BRAND NEW AND UNUSED

In maker's original sprung wood transit case.

LASKY'S PRICE **45/-**

Carriage 5/- extra.

6in. ENLARGER LENSES

Oil-filled plastic 19/6. Carriage 2/6 extra.

RADIO

ew Road) Ltd.,

DDINGTON. LONDON. W.9.

phones: CUNningham 1979 and 7214

Harrow Rd., Paddington, London, W.10. Tel. LADbroke 4075

TERMS: PRO Forms, Cash with order, or C.O.D. on post items only. Postage and packing on orders value £1 — 1/- extra, £5 — 2/- extra. £10 — 3/6 extra. Over £10 carriage free unless specifically stated otherwise.

DARK SCREEN FILTERS (LATEST TINT). 12¼in. x 14¼in. For 16 and 17in. c.r. tubes, 25/-. 11in. x 13¼in. For 9, 10 and 12in. c.r. tubes, 19/11.

BRAND NEW 12in. MASKS. LATEST ASPECT RATIO. Round face, with fitted dark screen filter. Dustproof. **SPECIAL OFFER 29/11. COMPLETE.** Postage 2/- extra.

E.H.T. TRANSFORMER FOR VCR97

Primary: 200-250 v., 50 c.p.s. Secondary: 2.5 kV., 4 mA.; 4 v., 1.1 a.; 4 v. (CT) 1.5 a.

LASKY'S PRICE **45/-**

Postage 1/6 extra.

BASES FOR VCR97 C.R. TUBES. Fully shrouded and insulated. 4/11.

CLYDESDALE

Bargains in
EX-SERVICE AND MANUFACTURERS' SURPLUS
RADIO & ELECTRONIC EQUIPMENT

THE R1155 AS A COMMUNICATIONS RECEIVER WITH 9 VALVES FOR 200-250 VOLTS A.C. MAINS.

Comprises :—RECEIVER UNIT R1155 WITH :— 5 Switched Bands, 18-7.5 mcs. = 17-40 metres. 7.5-3 mcs. = 40-100 metres. 1,500-600 kcs. = 200-500 metres. 500-200 kcs. = 600-1,500 metres. 200-75 kcs. = 1,500-4,000 metres.
7 Valves : VR99 (X65). 3 VR100 (KTW61). 2 VR101 (DH63). VI103 (Y.63) ME : DF Valves left out.
Simple controls. Slow motion 2 speed Tuning Manual Volume Control. Wave Change Switch. Also optional B.F.O., A.V.C., Magic Eye Tuning Indicator. In black metal case 16½ x 9 x 9in.

Plus :— COMBINED OUTPUT POWER PACK, with 2 valves, Pentode Output and Rectifier 8in. Speaker, Mains and output transformers, Tone Control, On/Off Switch. In black crackle metal case, 16½ x 9 x 9in.

ASK FOR No. X/E6A **£18.10.0** CARRIAGE PAID

A few only : R1155-N Model.
Range : 18-1.5 mcs., 1500-600 500-200 kcs.

ASK FOR No. X/H481 **£18.18.0** CARRIAGE PAID

Or with combined Output Power Pack at **£26 19 6**.

VENT-AXIA 6in. FAN. REF. : SA/2905
Moulded Plastic Fan housing assembly 7¾in. dia. (Max.) 8in. long, made in two interlocking sections for mounting in a circular aperture, and completely self-contained, mounted on metal frame 17½ x 9¾in. With suppressor unit 5C 870, input through 2P. Chassis Plug.
IN TRANSIT CASE.
ASK FOR No. X/H869 **£3.19.6** Each CARRIAGE PAID

AS ABOVE USED CONDITION
ASK FOR No. X/H869A **£2.19.6** Each CARRIAGE PAID

MONITOR CRYSTAL TYPE 2
Ref. : 10T 11390. As used with R1116 or R1082
Consists of metal front panel on which is mounted 2-large 4 BA terminals, 1-Red Warning Lamp, 1-large PO 4-way Jack, 1-6-way SP Switch, 1-Rotary ON/OFF Switch, 1-single Crystal Holder.
On a sub chassis, which is shock mounted, are 3 4-pin valveholders, 6-Crystal Holders, 2-Condensers, 1-choke, 1-transformer, 2-coils, plus numerous small condensers and resistors.
Housed in a plastic case 7½ x 5½ x 3½in.
In Transit Case.
ASK FOR No. X/H872 **6/6** Each POST 1/-

STARTER MOTOR Type CA4750
Heavy Duty 24 Volts Starter Motor, as used in Aircraft, with recessed splined spindle and mounting by 6 Bolts, Dim. : 8¼in. long, 4¼in. dia.
ASK FOR No. X/H870 **21/-** Each CARRIAGE PAID

192 PAGE CATALOGUE. NEW LIST No. 8D
Giving details and illustrations of ex-services items and cancelling all previous lists and supplements.

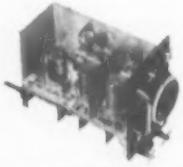
NOW IN THE PRESS and AVAILABLE SHORTLY
Price 1/6
Price credited on first purchase of 10/- or over.

TUBULAR STEEL MAST
Adm. Type APX 706 height 36ft. in 6 sections 1½ dia. special spring clip fitting, ensures very Rigid Assembly. Colour green, wgt. 43 lbs.
No base or lashings supplied.
ASK FOR No. X/H857 **37/6** Each CARRIAGE PAID

For inexpensive Television

R.F. UNIT TYPE 24
IN FAIR USED CONDITION
ASK FOR No. X/H851 **19/6** Each POST PAID

R.F. UNIT TYPE 25
IN ORIGINAL CARTON
ASK FOR No. X/H847 **30/-** Each POST PAID
IN FAIR USED CONDITION
ASK FOR No. X/E772 **19/6** Each POST PAID



R.F. UNIT TYPE 26
Ask for No. X/H848
67/6 Each POST PAID

R.F. UNIT Type 27
Ask for No. X/E771
63/- Each POST PAID

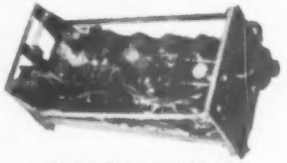
DATA FOR USING EX-SERVICE UNITS
REPRINTS FROM "PRACTICAL TELEVISION" :—
Article by B. L. Morley using Indicator Type 62 **1/6**
(Components Price List free on request).

The "Argus" T.V. Receiver, Blueprint and Data. **2/6**
(Components Price List free on request).

TRANSFORMERS
E.H.T. **55/-, 57/6, 59/6** or **65/-** each.
Mains (Morley), **55/-** and **60/-**. (Argus), **69/6** each.

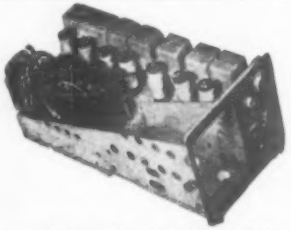
BOOKS ON TELEVISION

Television Explained (Iliffe)	5/3
The Television Receiver Practice	5/3
Inexpensive Television (No. 4) (S.W. Press)	2/6
T.V. Fault Finding (No. 5) (S.W. Press)	5/3
Television Construction Manual (Bernards 59)	3/6
Television Servicing Manual (Bernards 80)	4/6
High Definition Television Construction Manual (Bernards 89)	2/6
"Argus" T.V. Receiver Blueprint (PT)	2/6
Tele-King Circuit	6/-



R3170A RECEIVER UNIT
ASK FOR No. X/H492 **£4.12.6** CARRIAGE PAID

R3607 RECEIVER UNIT
ASK FOR No. X/H493 **£4.12.6** CARRIAGE PAID



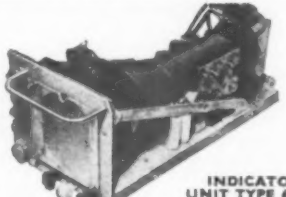
IF AF AMPLIFIER UNIT R.1355
IN ORIGINAL CASE
ASK FOR No. X/E770 **47/6** CARRIAGE PAID
2nd Grade in Transit Case, **42/6** CARR. PAID
3rd Grade, loose stored, **35/-** CARR. PAID
Circuit of R1355 available at 1/3.

5 CPI CATHODE RAY TUBE
ASK FOR No. X/H529 **35/-** POST PAID

INDICATOR UNIT TYPE 62
in Maker's original case
ASK FOR No. X/H526 **£5.9.6** CARRIAGE PAID
Also available, used, good condition.
ASK FOR No. X/E774 **79/6** CARRIAGE PAID

INDICATOR UNIT TYPE 62A
Used, Good Condition.
ASK FOR No. X/H868 **£7.19.6** CARRIAGE PAID

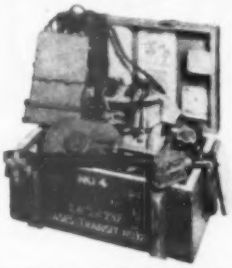
INDICATOR UNIT TYPE 6H
ASK FOR No. X/E777 **£4.9.6** CARRIAGE PAID



INDICATOR UNIT TYPE 6A
in Transit Case
Containing a VCR97 Cathode-ray Tube, with mu-metal screen, 4/VR91s (EF50), 3/VR54s (EB34), various w.w. pots, switches, H.V. conds., resistors, etc., built in metal chassis to fit into metal box 18 x 8½ x 7½in. All controls are brought to front panel beside viewing screen.
ASK FOR No. X/H887 **£4.9.6** CARRIAGE PAID

ORDER DIRECT FROM

COMPLETE STOCKS OF RADIO, TELEVISION AND COMPONENTS BY ALL THE PRINCIPAL MAKERS



METAL (MINE) DETECTOR NO. 4
Ref. ZA24238

Of Cdn. design and construction, using 1T4 pentodes. Comprising T.C. Amplifier, Search Coil, Sweep Pole, Control Box. Headphones, Test Unit and Ruck sack. Complete less batteries in fitted transit case.

ASK FOR No. X/H179 **£6.19.6** CARRIAGE PAID

METAL (MINE) DETECTOR NO. 3

In Original Transit Case Ref.: ZA.22755/1. Of British design and construction.
Comprises: A 3-valve AF Amplifier (ARP.12's = VP.23 Mazda), with space for dry batteries (not supplied) in metal box dim.: 10½ x 10½ x 3½in., with lead terminating in 7-way cable socket, contained in a carrying satchel, with high resistance headphones.
Search Coil, ZA.22175 or Equivalent, surface area 14½ x 10in.
Search Coil Pole, comprising: Control Box Pole and pivot-eye assembly. Pole (rear section) and Counter-weight assy.
Small Probe. Surface area 9 x 5½in.
The whole contained in original fitted transit case, dim.: 52½ x 14 x 10½in. Weight: Approx. 76 lbs.

ASK FOR No. X/H856 **£8.19.6** Each CARRIAGE PAID

Power Requirements, Dry batteries. L.T. 6 Type "S" 1½ volt cells. H.T. 60-90 volts.

TYPE 1. VISUAL INDICATOR
Ref.: 100/2. For R1155 D.F. Section.

Dual reading, Left Right D.F. meter, 2¾in scale. Dim.: 3½ x 2½in. overall, 4 hole fxg. 2½ x 2¼in. between centres. In used condition.
Ask for No. X/H862A

12/6 Each POST PAID

19in. RACK MGT. POWER UNIT TYPE 3 FOR A.C. MAINS 200-250 volts INPUT
OUTPUTS: 200 volts 40 ma. 6.3 volts 3 amps. 4 volts 1.5 amps. Complete and fully smoothed, with valve rectifier, 0/300 voltmeter, 0/150 milliameter (some do not have the voltmeter fitted, but supplied loose). Enclosed chassis size 19 x 7 x 11in. Finish dark grey.
In Transit Case.

ASK FOR No. X/H752 **£4.19.6** Each CARRIAGE PAID

RELAY Y974/H1 500 ohms COIL

6 make 6 break, Changeover, Standard P.O. type.
ASK FOR No. X/H891 **7/6** POST 1/-

A.C. MAINS 200/250 VOLTS, GRAMOPHONE MOTOR

Fitted with 9in. Turntable and Electrostatic Screen, mounted on a metal plate, approx. 14½ x 14in.
ASK FOR No. X/H319 **67/6** Each POST PAID

HEAVY DUTY VARIABLE RESISTANCE

Worm drive, heavy duty contacts, former length 6½ x 1¼in. dia. Mounted on assembly with cast end-plates. Dim.: overall Ht. 4¼in. Length less spindle 7¼in., Spindle 2 x ¼in. Resistance 7.5 ohms 4 amps.

ASK FOR No. X/H853 **25/-** Each POST PAID

No. X/H854 : construction as X/H853
Resistance 60 ohms, 1.5 amps.
21/- Each POST PAID

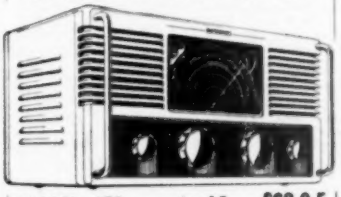
MAINS TRANSFORMER

Pri. 200, 220, 240 + 10 volts 50 c/s.
Sec. (1) 280-0-280 volts 190 ma.
Sec. (2) 6.3 volts 9 amps.
Sec. (3) 5 volts 2 amps.

All connections brought to paxolin panel mounted on transformer top. UPRIGHT MGT. Dim.: 5½ x 5½ x 4¼in. 4 hole fixing. 4½ x 3⅜in. between centres. Wgt. 11 lbs. nett.

ASK FOR No. X/H859 **65/-** Each POST PAID

EDDYSTONE
COMMUNICATIONS RECEIVERS



MODEL 670 inc. P.T. **£68.0.5**
FOR EXPORT £46/15/-.
10-51.7 metres and 110-575 metres in 4 ranges. The Marine Receiver. AC/DC 110/250 v. Seven Valves. Metal Rectifier. Fine Tuning Indicator.

ASSOCIATED ITEMS

Mains Filter Unit	£2/15/6
Doublet Aerial (50ft. feeder)	£2/17/9
Doublet Aerial (100ft. feeder)	£3/3/3

Prices subject to change without notice.
COMPLETE RANGE OF RECEIVERS AND COMPONENTS ALWAYS AVAILABLE

MILLIAMETER RANGE 0-5
2in. square drilled flange.

ASK FOR No. X/H537 **12/6** Each POST PAID

SPECIAL OFFERS

R1155, R1155A RECEIVER UNITS

Fully reconditioned and tested (complete, less power pack) **limited quantity only.**
ASK FOR No. X/H898 **£7.19.6** Each CARRIAGE PAID

VALVE HOLDERS, TOP GRADE

E67 International Octal, Ceramic 1/- each, post 1½d.
H889 International Octal Moulded **9d.** each, post 1½d.
E63 B9G (EF50) Loctal, Ceramic 1/- each, post 1½d.
H890 B7G (6AM6) Noval, Moulded **9d.** each, post 1½d.
H897 B9A (12AU7) Noval, Moulded **9d.** each, post 1½d.
Dozen lots, Ceramic **10/6** doz. Moulded **7/6** doz.

MINIATURE VOLUME CONTROLS
(Carbon Track)

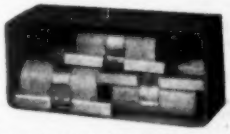
Dia. 1¼in. single hole fixing (Standard).
H893 2 Megohms. (log) with 1¼in. spindle DP/Switch 4/- each, post 3d.
H894 ½ Megohm. (log) with 1¼in. spindle DP/Switch 4/- each, post 3d.
H895 ½ Megohm. (log) with 1¼in. spindle, no switch **2/6** each, post 3d.
H896 ½ Megohm. (lin) with ¼in. spindle, no switch **2/6** each, post 3d.

ELECTROLYTIC CONDENSER

32 mfd. capacity 450 V.D.C. Wkg. Aluminium cased, tubular with waxed cardboard insulating cover. Dim.: 4¼in. long, 2in. dia.

ASK FOR No. X/H852 **3/-** Each POST **6d.**

SPECIAL CONDENSER OFFER



Comprising 3 (H852), 32 mfd. E1. Condensers with mounting plates in original carton.
ASK FOR No. X/H852 **7/6** Each POST **9d.**

METAL CASED PAPER CONDENSER

4 mfd. capacity, 2,000 V.D.C. Test. Dim.: Overall, 5½ x 4 x 1¼in.
ASK FOR No. X/H860 **4/6** Each POST **3d.**

U.S.A. METAL CASED PAPER CONDENSERS
Made by Electrical Utilities.

4 mfd. capacity 500 v. D.C. wkg. Dim.: 3½ x 2½ x 1¼in. overall.
ASK FOR No. X/E257 **2/6** Each POST **3d.**

4 mfd. capacity 350 v. D.C. wkg. Dim.: 3½ x 2½in. x 1¼in. overall.
ASK FOR No. X/E258 **2/-** Each POST **3d.**

Carton of 20 E258 Condensers.
ASK FOR No. X/E258X **30/-** POST PAID

HALF MILE REELS OF WIRE

Metal Reel 8½in. Dia. x 3in., containing **880** yards of single P.V.C. covered 23 s.w.g. Wire. Wgt. 12 lbs. nett.
ASK FOR No. X/H855 **39/6** per REEL POST PAID

CLYDESDALE SUPPLY CO. LTD.,
2 BRIDGE ST., GLASGOW, C.5
Phone: SOUTH 2706/9
BRANCHES IN SCOTLAND, ENGLAND AND NORTHERN IRELAND

GARLAND

WE WISH ALL CUSTOMERS AND COLLEAGUES PAST AND PRESENT, HOME AND ABROAD A HAPPY XMAS AND A PROSPEROUS NEW YEAR

GARLAND ACIV AMPLIFIER (C). Providing exceptionally wide frequency response and low harmonic distortion at a maximum output of 11.5 watts. High and low gain inputs with bass, treble and volume controls. Standard valves throughout. **15 gns.**, plus 15/- carriage, etc.
GARLAND KIT for ACIV, **£13**, plus 15/- carriage, etc.

AMPLIFIER ACII (C). Incorporates volume and tone controls, providing 4 watts output. The chassis is completely isolated from the mains. Amplifier wired and tested, **£6/2/6**, plus 5/- carriage.
GARLAND KIT for ACII, **£5/2/6**, plus 5/- carriage.

HIGH FIDELITY TAPE RECORDING TRUVOX 2-speed push-button Tape Deck (C), incorporating high impedance mumetal twin-track heads, fast forward and rewind without tape handling, heavy-duty non-gramophone type motors. **£23/2/-**, plus 10/- carriage.

GARLAND RP8 6-watt push-pull record-playback-gramophone amplifier, designed primarily for use with the above. With built-in power supplies and oscillator unit, magic-eye record level indication. 8in. p.m. speaker and provision for use with external 3 ohm or 15 ohm speaker. **£19/19/-**, plus 10/- carriage.

HIGH QUALITY AMPLIFIERS (C). LEAK "Point One" TL12/12 watt, **27 guineas.** LEAK RC/PA/U remote control pre-amplifier, **9 gns.** LEAK "Vari-slope" pre-amplifier, **12 gns.** ACOUSTICAL QUAD 12-watt Amplifier (including pre-amplifier) **£35.** ROGERS "WILLIAMSON" AMPLIFIER, **£31.** "WILLIAMSON" PA/TC/UNIT. **£10/7/6.** ROGERS "RD BABY DE LUXE" including pre-amplifier, **£18.** ROGERS "JUNIOR DE LUXE" 10 watt, **£26/10/-.** ROGERS "MINOR" 4 watt, **£11.**

GARLAND TAPE RECORDER LU.7. (C) Incorporating the Lane Tape Table and the Garland UE.7 amplifier built into a matched walnut veneered cabinet. For direct record and playback from radio, mike or pick-up. Price, including a 1,200ft. reel of "Scotch Boy" Tape and a spare spool, **£37/10/-**, plus 15/- carriage, etc. Trade supplied.
GARLAND KIT for this recorder, **£32/5/-**, plus 15/- carriage, etc.

DE LUXE TAPE RECORDER CABINETS (C). Matched figured veneered Walnut, with hinged lid and removable back. Internal dimensions, 16in. x 11in. x 12in.; front aperture 10½in. x 2in. for control panel or chassis front. 8in. speaker baffle with gold expanded metal grill. Designed to take UE7 Amplifier and Lane Tape Table; could also be used for a record player. Price **£6.**

SCOTCH BOY MEDIUM COERCIVITY TAPE. We recommend this tape for use with ALL GARLAND Tape Recorders. Now available in the following lengths. 1,200ft. **35/-**; 600ft. **21/-**; 300ft. **12/3.** Spare 7in. spools (1,200ft.) **4/3.**

RECORD PLAYERS (C).
COLLARO RC511 single-speed Autochanger. Magnetic, price, £11/14/11, incl. P.T. Crystal price, £12/3/2 incl. P.T.
COLLARO 3/RC511 3-speed Autochanger with two heads, **£18/14/1.**
BSR MONARCH 3-speed Autochanger with reversible pick-up, price £17/17/-.
GARRARD RC.75 3-speed Autochanger, **£16/6/6.**
COLLARO AC47 single-speed turntable and motor. Centre driven by heavy induction motor. Price **£6/13/4** incl. P.T.
COLLARO AC516 Record Player. Single speed rim-drive with pick-up. Price **£6/19/-** incl. P.T.
BSR single-speed motor and turntable MU.15. Price **£3.** Fitted in portable bakelite cabinet, **£4/10/-.**
DECCA 3-speed Gram. motors. Price incl. P.T. **£6/8/6.**
DECCA Turnover Pick-up for use with above motors. Price incl. P.T. **£3/19/4.**
ACOS G.P.20 Standard or long playing, price **£3/11/5.** Spare heads £1/3/4.

MICROPHONES
Ronette B110 Crystal microphone, **£2/12/6.** Ronette HM7 Filtercell Microphone, **£3/7/6.** The following stands are suitable for the above microphones. Floor stand, **£4/10/-.** Table Stand, **£2/12/6.** Desk Stand, **15/6.**

GARLAND UE.7 RECORD PLAYBACK AMPLIFIER (C). This Amplifier is specially designed for the Lane Tape Table but is suitable for use with any high impedance head. Incorporates all Garland star features. Five standard valves are used providing supersonic bias and erase and equalise record and playback facilities. Complete with 8in. loudspeaker. Amplifier wired and tested **12 gns.**, plus 7/6 carriage, etc. *Trade supplied.*
GARLAND KIT for this Amplifier **£9/15/-**, plus 7/6 carriage, etc.

PORTABLE CABINETS. For Truvox or Lane, with RP8 or UE7 Write for details

LANE TAPE TABLE (C) Three motors; very fast wind-on and rewind; automatic braking; high impedance, half gap heads; tape speed 7½in. per sec. Price **£16/10/0**, plus 10/- carriage. Trade supplied.

VIEW-MASTER TELEVISION. The following complete kits are available from stock. Instruction booklet and complete plans, **7/6.** Complete kit, less valves and tube, **£31.** Stage 1, 61/-; Stage 2, 42/9; Stage 3, **£3/1/8**; Stage 4, 9/10; Stage 5, **£10/4/-**; Stage 6, **£7/5/9**; Stage 7, 53/-. Single items, WB100, 18/6; WB101, 6/-, WB107, 18/6; WB103, 42/-; WB103A, 52/6; WB104, 15/6; WB105, 32/6; WB106, 25/6; WB107, 32/6; WB108, 33/3; WB109/1 or/2, 22/6; WB110, 10/-; WB111, 5/9; WB112, 9in., 21/- or 12in., 21/6; WB300 pre-amp. chassis, 17/6; Westinghouse rectifier, kit, 69/-; 36EHT100, 29/5; 35EHT50, 26/1; 36EHT4S, 23/8; 14A86, 20/4; 14D36, 11/7; WX3 and WX6, 3/9. Wearite coils and choke, all channels, 30/-; TCC condensers, £7/7/-; 6 Colvern pots, 22/6; Morganite resistor kit, 33/3; Bulgin kit, 13/-.

ELECTRONIC ENGINEERING TELEVISOR all components in stock as previously advertised.

BROS, Ltd.

I.F. TRANSFORMERS. Small size, 2¼in. x 1¼in. x 1in., 13/6 per pair. Made for us by a leading manufacturer.

UNDRILLED CHASSIS. In 20 s.w.g., bright mild steel : Four-sided size 13in. x 7in. x 2¼in., 7/6 each ; two-sided with two straps, size 12in. x 4in x 2¼in., price 3/9 each. Two sided with two straps, size 6 x 5 x 2in., price 2/6 each.

T.R.F. KITS. Three valve and rectifier receiver, in two-tone Walnut veneered cabinet size, 12in. x 5in. x 7in. Valve line-up 6SH7, 6SH7, 6K6, 2xRM2 metal rectifiers. As is usual all main components are supplied mounted on the chassis. Kit includes circuit diagram, but does not include wiring diagram or instructions. Price, £6/17/6 (C).

TWO-GANG TUNING CONDENSERS. Standard size 2-gang of 500pF capacity, with fixing feet. Price 8/6.

OSMOR COIL PACKS. Type H.O. mains superhet 15-50, 190-520, 800-2,000 metres, 52/-. Type TRF medium and long waves incorporating a reaction winding, 43/4. Type B for mains or battery portable receivers using a frame aerial and covering 15-50, 190-560, 800-2,000 metres 54/2. All the above prices include purchase tax. Note : Included with each coil pack are complete circuits and layout diagrams.

WEARITE 705 COIL PACK. For mains superhets covering long, medium and short waves. An additional position is provided on the switch for gramophone. Price including purchase tax £2/13/4.

REACTION CONDENSERS. Solid dielectric, also suitable as tuning controls in one-valve receivers. Available in 300 pf and 500pf sizes with standard ¼in. spindle. Price 3/10.

AMPLION CONVETTES. These units enable a battery receiver to be operated from the A.C. mains. Model AD2 supplying 90 volts H.T. at 10 mA 1·4 volts L.T. at 250 mA., price £4/19/6. Model VA1, 120 volts at 10 mA. and 2 volts at 0·8 amp., price £4/19/6. Model M2V 100-140 volts at 10-20 mA., and 2 volts 1 amp. This unit also incorporates an L.T. voltmeter. Price £6/16/6.

TYANA SOLDERING IRONS. Light weight, 40 watt irons with easily interchangeable elements and 3/16in. diameter bits. Voltage ranges, 100-110 v., 200-220 v. and 230-250 v. Price 16/9. "The iron that makes soldering a pleasure."

CERAMIC SWITCHES. Single pole, eight-way, 3/6 each.

J.B. SQUAREPLANE DIALS. Printed in two wavebands with station names. 8/1 drive and bronze escutcheon and glass. Price 12/9.

J.B. FULL VISION DIALS. Similar to above but with 7½ x 3¼in. dial printed in three wavebands. Price 13/-.

DECALS. 500, ¼in. high white transfer letters and words for marking electronic equipment. Price 4/9 per book.

CARBON RESISTORS

ONE-THIRD TO ONE-HALF WATT : 10, 13, 15, 22, 33, 39, 56, 68, 71, 73, 100, 150, 170, 180, 220, 250, 270, 330, 390, 400, 450, 470, 500, 530, 600, 680, 820, 1k, 1·2k, 1·5k, 2·2k, 3·3k, 3·9k, 4k, 4·7k, 5·6k, 6·2k, 6·8k, 7·5k, 8·2k, 10k, 12k, 15k, 18k, 20k, 22k, 24k, 25k, 27k, 30k, 33k, 39k, 40k, 47k, 50k, 56k, 100k, 150k, 220k, 270k, 330k, 470k, 680k, 1m, 1·2m, 1·5m, 2m, 2·2m, 2·7m, 3·3m, 4·7m, 10m. All at 4d each.

ONE WATT : 50, 56, 82, 120, 150, 240, 330, 390, 680, 1k, 1·5k, 2·2k, 3k, 3·9k, 4·7k, 5·1k, 5·6k, 6·8k, 10k, 12k, 18k, 22k, 24k, 27k, 33k, 68k, 70k, 80k, 170k, 330k, 390k, 470k, 680k, 750k, 1m, 2·2m. All at 6d. each

TWO WATT : 220, 1k, 2k, 2·2k, 3k, 3·3k, 4·3k, 4·7k, 6k, 10k, 12k, 20k, 22k, 27k, 30k, 47k, 50k, 68k, 2·2m. All at 9d.

FOUR WATT : 500k, 1/- each.

WIRE WOUND RESISTORS. Open, cement coated or vitreous enamelled. 4 watt, 21, 50, 90, 100, 200, 1 k. Price 1/- each. 6 watt, 30, 145, 250, 270, 10 k., 15 k. Price 1/6 each. 10-15 watt, 5, 90, 100, 120, 170, 175, 200, 250, 400, 500, 600, 700, 750, 950, 1 k., 1,690, 3·5 k., 3·6 k., 4·5 k., 11 k., 15k., 20 k., 25 k., 47 k., 50 k. Price 1/9 each. 15 watt, 650 ohm. Price 2/-.

LOUDSPEAKERS at PRE-TAX PRICES. By leading manufacturers. Brand new and fully guaranteed. 5" p.m. moving coil 12/6. 5" mains energised, with output transformer, 19/6. 8" p.m. moving coil, 17/6.

METAL RECTIFIERS

Type RM2, 125 v. at 100 mA. Two in series required for mains voltage. Price 4/6 each. Type 14D/972, providing 250 v 25 mA. when used with a reservoir condenser. Small size ideal for test equipment also in place of 14D/36 in T.V. circuits. Price 6/6 each. 6 v. 1 a. half-wave for full wave with C.T. tfmr.), price 5/- each ; 12 v. 1 a. bridge, price 8/6 each ; 12 v. 4 a. bridge, price 32/6.

SENSITIVE NEONS : 85 v. striking. SBC with centre contact. Ideal for record level indicator on tape recorders, mains indicator, etc., 2/6 each.

HIGH VOLTAGE MICA CONDENSERS 0·1μF 1,500 v. wkg. Bakelite-cased upright mtg. 3in. x 2¼in. x 1¼in. overall, 2/- each. Ceramic pot type, 10C/2178, 0·0002μF 5 kv wkg., high H.F current, 2/6 each. Flat bakelite-cased type, ZA2837, 0·001μF, 5 kv. A.C. test, 0·5 A. at 2·8 mc. ; size 3¼in. x 1¼in. x ¼in. ; suitable tx or tv, 1/9 each. 0·002μF, 2·5 kv. wkg , 1/3.

TOROIDAL CERAMIC POTENTIOMETERS. 17k, 100 watt, 8/6.

TOGGLE SWITCHES. SPCO, 250 v. 2 amp., 1/9 ; DP on-off 250 volt, 1 amp., 2/3.

ENGRAVING TOOL. Operates from 200-240 volt A.C. for engraving on metal and plastic, price, 12/6.

WAFER SWITCHES

For ¼in. dia. spindle. Length of spindle quoted from end of bush.

3p. 2w. ¼in. 1/9.
6w. paralelling ¼in., 1/9
1p. 3w miniature ¼in., 1/3.
4p. 2w. miniature ¼in , 1/9.
1p. 10w., ¼in., 1/9.
1p. 11w, ¼in., 2/-.
3p. 3w. miniature 7/16in., 1/9.
4p 3w. miniature 2¼in., 3/6.
4p. 3w. ¼in., 1/9.
4p. 2w. 4 bank ¼in., 3/6
3p 3w. 3 bank ¼in., 3/-

FIXED CONDENSERS (pF's) : Ceramic : 4, 4, 15, 20, 27, 30, 50, 220, 350. All at 9d. 1,000pF, 1/-. Silver Mica : 10, 30, 50, 160, 170, 180. All at 6d. 200, 300, 1,500, 8,100, 9d.
Moulded Mica : 50, 75, 100, all at 6d. 300, 470, 1,000, 2,000, 3,000, 4,000, 4,500, 4,700, 5,000, 10,000, all at 9d.

CLOSE TOLERANCE SILVER MICA CONDENSERS. All plus or minus 1 per cent. 100pF, 400pF, 9d. each. 1,000pF, 1,400pF, 1/3 each. 10,000pF, 1/6 each.

SPECIAL TYPE VALVE OFFER. CV1141 (NGT1), 4 v. THYRATRON. Electronic relay for timers, etc. B5 base, 6/6 each. CV265 4 v. ½-wave high current rectifier. 10 base 5/- each. 7193 6.3 v. UHF triode. Plug-in replacement for 6J5G if anode and grid top caps connected to pins 3 and 5. 10 base, 2/6 each. 6SH7 6.3 v. HF pentode. For T.V. amplifiers, receivers, etc. 10 base, 6/6 each. RL18 6.3 v. miniature triode B3G base, 5/- each. 6U5G 6.3 v. magic eye. Ideal for bridges, recorders, etc. 10 base 7/6 each. U22 2 v. EHT rectifier for T.V. MO base, 8/6 each.

MULTI-PURPOSE TOOL. Bends, shears, punches and threads sheet-strip and rod. For all the little workshop jobs that waste your time. Tool price, 10/-. Jig, gauge and protractor for use with this tool, enabling repetition work to be carried out with precision, 7/6.

VARLEY MAINS TRANSFORMERS. Primary 10-0-200-220-240 volts. Secondary 300-0-300 volt at 150 mA., 5 volt at 3 amps., 6.3 volt at 4 amps., 6.3 volt at 1 amp. Open type construction. Price 45/-.

AERIAL RODS. These 12in. long tubes are once again available, made of copper plated steel. Fit into each other to make up any length aerial. Price per doz., 2/6 ; per gross, 21/-.

TAPE RECORDER OSCILLATOR COILS. Inductance 6.3 mH, giving frequency of 45 Kcs with a .002 mfd. condenser. For use with high impedance heads. Made for us by a leading manufacturer. Price 6/9 each. *Trade supplied.*

SUPERHET PACK. Consisting of a walnut Cabinet, size 19in. x 13in. x 8in., complete with Perspex dial ; undrilled chassis size 13in. x 7in. x 3in ; 8in. Elac speaker ; 500pF twin-gang tuning condenser ; 250-0-250 v., 6.3 v. and 5 v., mains transformer ; L.F. choke ; output transformer ; 16-24 mfd. 350 v. electrolytic condenser. These items are not surplus, but current production goods. Price £4/15/-, including packing and carriage (G.B only). (C)

CLEAREX TELEVISION MAGNIFYING LENS. 9in. clear, 55/- ; 9in. filter, 60/- ; 12in. clear, 75/- ; 12in. filter, 80/-. Carriage and packing 5/- each on all types. (C)

ALL GOODS NEW AND UNUSED. **ITEMS (C) REQUIRE CRATING FOR SAFE DESPATCH. CRATES ARE NOT CHARGED PROVIDED YOU UNDERTAKE TO RETURN CARRIAGE PAID TO US.**
PLEASE ADD POST OR CARRIAGE ON ALL ITEMS. KINDLY PRINT NAME AND ADDRESS. POST ORDERS TO OUR DEPTFORD ADDRESS. EARLY CLOSING THURSDAY, OPEN ALL DAY SATURDAY

GARLAND BROS, Ltd.

CHESHAM HOUSE, DEPTFORD BROADWAY, S.E.8
Telephone: TIDEWAY 4412/3

5 OBELISK PARADE, LEWISHAM, S.E.13
Telephone: LEE GREEN 4038

251-10
P

BUILD A PROFESSIONAL RADIO OR AMPLIFIER AT LESS THAN HALF TODAY'S PRICE

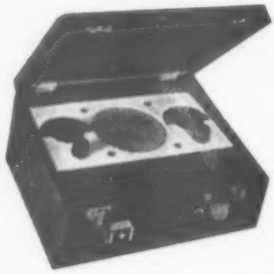
You're SURE to get it at

STERN'S

ESTABLISHED 25 YEARS

ALL KITS INCLUDE "EASY TO FOLLOW" POINT-TO-POINT WIRING DIAGRAMS

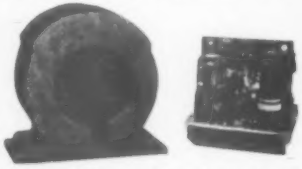
A MAINS OR BATTERY PORTABLE KIT



A Midget 4-valve Superhet Portable Set covering medium and long wavebands.
Designed to operate on A.C. mains 200/240 volts, or by an "Alldry" battery. The set is so designed that the mains section is supplied as a separate unit which may be added at any time. The Kit therefore can be supplied (as an "Alldry" Battery Superhet Personal Set which can then be accommodated in the Attache Case as illustrated above (size 9½in. × 4½in. × 7in.). This is attractively finished in beard, maroon, dark green or blue rexine (to order as a Combined Mains/Battery Superhet Portable Receiver, for which a polished Wood Cabinet is available to accommodate both Mains Unit and Batteries together.
Circuit incorporates delayed A.V.C. and Pre-selective Audio Feedback. Kit is complete in every detail and includes ready-wound Frame Aerials, fully aligned I.F. Transfs., and drilled Chassis, etc. Overall size of assembled chassis 6in. × 6in. × 2½in.
This Receiver as illustrated, can be completely built for approx. £10 (plus Mains Unit if required). Send 1/9 for the fully descriptive Assembly Book which includes Practical Layouts and complete price list of Components.

THE "MINI-TWIN" 1-VALVE BATTERY SET

A design of a simple 1-valve 2-Stage Battery Receiver, giving excellent results on Medium and Long Wavebands and having exceptionally low Battery consumption.



Drilled Chassis and Practical Diagrams make it the ideal set for the beginner to build.
The complete chassis including valve can be built for 37/6 the attractive Plastic Case is 9/6, and suitable headphone 14/9.
The complete Assembly Instructions, Layouts and a "Component Price List are available for 1/6.
This Receiver also performs excellently, without modification, as a Tuning Unit, and in addition, with simple modifications for which a complete diagram is provided makes a first-class Preamplifier for Pick-Up or Microphone.

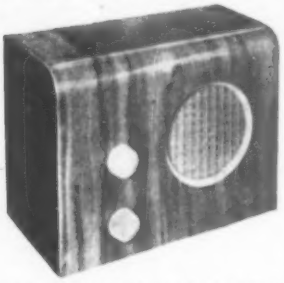
STERN'S "RADIO TUNER MANUAL" Price 2/6
(Plus 3d. post.) Contains complete and detailed Assembly Instructions showing how to make:—
A 1-valve T.R.F. Tuning Unit, covering long and medium wavebands.
A 4-station "Pre-set" Superhet Tuning Unit, producing 3 Stations on medium waveband and 1 on long wave.
A 2-Valve Superhet Tuning Unit, covering short, medium and long wavebands.
Each Tuner is for A.C. mains operation. Circuit Diagrams and Practical Component Layouts are shown, together with Complete Component Price Lists.

PICK-UPS

Co.mocord "G.P.20," for standard records. £3/11/5
Interchangeable (G.P.19) Head for L.P. records. £2/3/4
Decca lightweight "turnover Head" type, for L.P. and standard records. £3/19/2.
Marconi, Standard, lightweight Magnetic. £1/15/10
Marconi Matching Transformer, 7/6.
Goldring, Standard, lightweight, Magnetic. 35/10.

A MIDGET 4-STATION "PRE-SET" RECEIVER

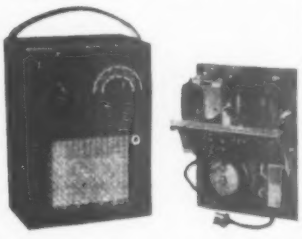
A complete Kit to build a 4-station "Pre-set" Superhet Receiver for A.C. mains operation.
The Set is designed to receive any three Stations on medium waveband and one on long wave, each Station being received by the turn of a Rotary switch—No Tuning being necessary.
It is of midget size, being 8in. × 4½in. × 7in. high, and has the performance of a far more expensive ready-made set, but can be built for half the price.



Price of complete Kit of Parts (including aligned I.F. Transf. and drilled Chassis, etc.), £9/15/- (incl. P.T.) (plus Cabinet 25/6), or the components can be purchased separately. The complete Assembly Instructions, including Individual Component Price List, Circuit and Component Layout, etc., are available for 1/9.

THE "MINI TWO-THREE" BATTERY PORTABLE

An "Alldry" Battery Portable of midget size, 6½in. × 4½in. × 3½in., designed to cover medium waveband 190-550 Metres, with use of short trailer Aerial).



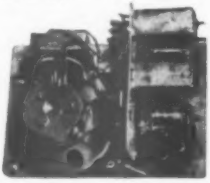
The simple design of this Receiver is so arranged that either a 3-valve Set or a 2-valve (afterwards easily converted to the 3-valve) can be made.
Consists of a T.R.F. circuit, using a Regenerative Detector with H.F. Stage, and a High Gain Output Pentode. Valve line up IT4—1T4—DL94.
The 2-valve Set can be completely built for £4/3/6 (less Case), and the 3-valve for £5/3/- (less Case). Each price includes Valves, Speaker and drilled Chassis.
Send 1/9 for the Assembly Instructions, they include simple and complete Practical Component Layouts and Diagrams, which enable the most inexperienced constructor to successfully build either Set. All Components are available for separate sale. A price list being supplied with the Assembly Instructions.

THE "WIRELESS WORLD" 3-VALVE SET

A Midget 3-valve T.R.F. Receiver for operation on A.C. mains, covering long and medium wavebands.
We are able to supply all of the components to build this set, as designed and specified in the Feb. 1950, issue, including the drilled Chassis, Valves and moving coil Speaker etc., at the following prices:—
To construct complete Chassis, less Dial and Drive Assembly £5/5/-. Ditto, including Dial and Drive Assembly, £6.
To construct the complete Set, including Dial and Drive Assembly and Cabinet, £7/3/6.
Overall size of Cabinet is 7¼in. × 8¼in. × 11¼in.
A reprint of the designer's article, giving Circuit and Assembly Instructions (this is available separately for 9d.) together with a Practical Component Layout is included with each of above assemblies.

THE "PRACTICAL WIRELESS" "MINI FOUR" BATTERY PORTABLE

A 4-valve Battery Superhet Receiver designed to receive 4 Pre-set Stations, three on medium waveband and one on long wave to suit local conditions. Each Station is obtained on the set by the turn of a Rotary Switch. No tuning is necessary.



It is of midget size, being only 4½in. × 6½in. × 4½in. when completely built, and is very easily assembled from diagrams supplied.
Cost of all components to build this Set, in accordance with the design, including a drilled and cut chassis and panel and new valves, is £8/10/- (or less valves for £6/7/6). Attractive carrying case finished in blue leatherette, 16/9.
Complete constructional data with a blueprint, which shows the Practical Component Layout and Wiring Diagram, together with an Individual Component Price List is available separately, 1/6.
Our Battery Eliminators (illustrated opposite) available in kit form are suitable for use with this set.

THE "WIRELESS WORLD" MIDGET A.C. MAINS 2-VALVE RECEIVER

We can supply all the components to build this set, including Valves and Moving Coil Speaker for £3/10/-, including designers' Complete Building Instructions (these are available separately for 9d.)

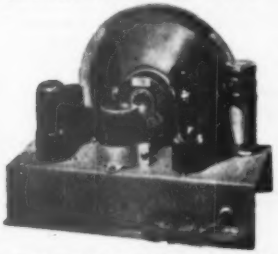
★ *Send 9d. P.O. for our New DECEMBER STOCK LIST, it shows PARTS for both Sets and Battery Chargers. When*

STERN RADIO LTD., 109

Tel: CENtral

A Complete Kit of Parts to build a 3-4 WATT HIGH GAIN AMPLIFIER

for operation on A.C. or D.C. Mains, 200-250 volts



This amplifier will give 3 Watts output for the small input voltage of only 75 millivolts, and is therefore suitable for use with any type of pick-up from the crystal type to the miniature H.P. Magnetic type.

A tone control is incorporated and the quality produced is excellent. The overall size of chassis is 9in. × 5in. × 7in., and valve line up 25Y5-6eH7-25L6.

Price of complete kit including drilled chassis and Valves **£4/2/6**, plus 6/in. P.M. (which fits on chassis), **16/-**, or 8in. P.M., **18/6**.

Price of fully assembled chassis ready for use, **£5/5/-** (plus cost of speaker).

Copy of Assembly Instructions and Components Price List available for 1/3.

! ! AMPLIFIERS ! !

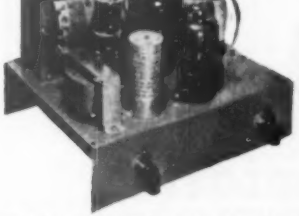
TWO COMPLETE KITS OF PARTS

(a) **A 6-8 watt QUALITY "PUSH-PULL" DESIGN**, which is the type illustrated below.

(b) **A 12 watt HIGH FIDELITY "PUSH PULL" AMPLIFIER.** Both for operation on A.C. mains 200 to 250 volts.

THE 6-8 watt AMPLIFIER incorporates a simple arrangement to enable either a Magnetic, Crystal, or Lightweight pick-up to be used and is suitable for use with Standard or Long Playing Records. A Tone Control is incorporated, and the 10 watt Output Transformer is designed to match 2 to 15 ohm speakers.

The overall size of the assembled chassis is 10in. × 8in. × 7½in. high, and full practical diagrams are supplied. Price, including drilled chassis and valves, of complete kit, **£6/17/6**. Price of assembled chassis, supplied ready for use, **£8/12/6**. Full descriptive leaflets are available separately for 1/-.



THE 12 watt HIGH FIDELITY "PUSH PULL" AMPLIFIER employs 6 valves plus Rectifier, with Negative Feedback, and comprises a main Amplifier Chassis and a Remote Control Unit incorporating four controls—Bass, Treble, Main Volume or Mixing Control, and a Radio, Gram, Microphone, Selector Switch. This Control Unit measures only 7 × 4 × 2in.

The measured frequency range of the Amplifier with this Unit shows an excellent response from 1,400 cycles down to 20 cycles, the Bass and Treble Controls allowing independent control of gain at both ends of the frequency range from zero to a gain of 50. It can be seen therefore that ample correction is provided to suit any type of Pick-up with any type of recording.

Input voltage for maximum output is 70 mV. 6.3 volts at 2 amps and 300 m/a. H.T. is provided for Tuning built-in etc. Price of complete kit, including drilled chassis and valves **£14/10/-**. Complete specification and layouts 1/6.

THIS AMPLIFIER COMPARES WELL WITH THE WILLIAMSON AND SIMILAR DESIGNS AT A FRACTION OF THE COST.

You're SURE to get it at

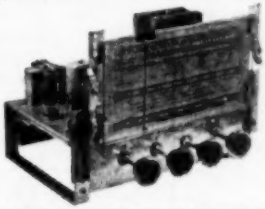
STERN'S

ESTABLISHED 25 YEARS

TWO COMPLETELY ASSEMBLED "ALL WAVE" SUPERHET CHASSIS

(a) **MODEL B.3.** A 3 Valve 2 Waveband Superhet Receiver.
(b) **MODEL B.** A 5 Valve 6 Waveband (4 Bandspread) Superhet Receiver.

Both Receivers are for operation on A.C. Mains 100/120 Volts and 200/250 Volts, and employ the very latest miniature valves. They are designed to the most modern specification, great attention having been given to the quality of reproduction which gives excellent clarity of speech and music on both Gram and Radio, making them the ideal replacement Chassis for that "old Radiogram" etc.



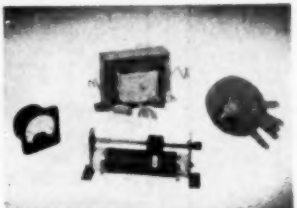
Brief Specifications: **Model B.3.**—Valve line up, CBL6, CBA6, CAT6, 6BW6, 6X4—Waveband coverage, Short 16-50, Medium 187-550, Long 900-2,000 metres. Controls (1) Volume with on/off; (2) Tuning (Flywheel type); (3) Wavechange and Gram; (4) Tone (3 position switch operative on Gram and Radio).

Negative Feedback is employed over the entire audio stages. Chassis size 11 × 7½ × 8½in. high. Dial size 9½in. × 4½in. Price, complete and READY FOR USE, excluding speaker, **£12/12/-**. (Carr. & Pkg. 5/- extra).

Model B employs a similar valve line up as the B.3, but covers 6 Wavebands. Short wave 11-16, 16-25, 23-33, 31-46, and 43-120 metres, and Medium Wave 187-550 metres. The first four short bands are Bandspread. The Controls employed are as used on the B.3 model but the Tone Control employs a six position switch, having three additional positions for varying Bass and Treble on Gram reproduction.

Negative Feedback is employed over the entire Audio Stage. Size of Chassis and Dials as given for B.3. Price complete and READY FOR USE, excluding speaker, **£15/15/-**. (Carr. & Pkg. 5/- extra).

BATTERY CHARGER KITS



All Kits incorporate Metal Rectifiers, and are for use on A.C. mains 200-250 volts. All Kits include an easily followed Wiring Diagram.

For charging 2 4- or 6-v. batteries at 1 amp., **£1/9/-**.
For charging 6-volt battery at 1 amp. with Variable Resistor and Meter, **£2/12/6**.
For charging 12-volt battery at 1 amp., **£1/9/3**.
For charging 12-volt battery at 2 amp., with variable Resistor and Meter, **£2/14/-**.
For charging 6- or 12-volt battery at 2½ amps., **£2/1/-**.
For charging 6- or 12-volt battery at 2½ amps., with Variable Resistor and Meter, **£3/8/3**.

A 5-VALVE "ALL-WAVE" SUPERHET RECEIVER

For use on A.C. Mains 200 to 250 volts.

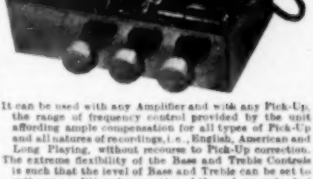
This small attractive Receiver, embodying modern circuit technique is designed to cover short, Medium and Long wavebands, and incorporates the following outstanding features:

- A superhet circuit designed for high efficiency on all three wavebands.
- A 5in. P.M. Speaker accurately matched for good quality reproduction.
- The latest range of new 6-volt B.V.A. miniature valves.
- Built in Frame Aerial with provision for external aerial for distant stations.
- A White Plastic Cabinet of very attractive appearance overall size 7½in. × 9½in. × 5½in.
- THE RECEIVER AS ILLUSTRATED CAN BE BUILT FOR APPROX. **£10/10/-**.

Send 2/6 for the fully descriptive stage by stage assembly and wiring diagrams, with which complete price details are given.

A DUAL CHANNEL PRE-AMPLIFIE and TONE CONTROL UNIT

This comprehensive PREAMPLIFIRE and TONE CONTROL UNIT provides full control of Bass and Treble, in conjunction with a main Volume Mixer Control.



It can be used with any Amplifier and with any Pick-Up, the range of frequency control provided by the unit affording ample compensation for all types of Pick-Up and all natures of recordings, i.e., English, American and Long Playing, without recourse to Pick-Up correction.

The extreme flexibility of the Bass and Treble Controls is such that the level of Bass and Treble can be set to suit any conditions irrespective of the volume output of the Amplifier.

Response characteristics are given in 12 watt Amplifier advt.

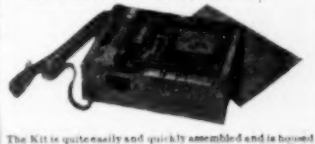
The Unit measures only 7in. × 4in. × 2in. including self contained Power Supply, and can be accommodated either on or away from the main Amplifier, i.e., on the front panel of a Cabinet, or any other position. Price, including drilled chassis, valves (6SN7 and 6J5), **£3/16/9**. Complete assembly data is available separately for 1/-

The Viewmaster Televisor.—We have had very considerable experience in assisting customers to build this T.V. and can supply all SPECIFIED COMPONENTS EX-STOCK. The Assembly Instructions showing Practical Layouts and Price List are available for 7/6 for London, Sutton Coldfield, Holme Moss, Kirk-o'-Shotts and Wenvoe. Complete Television Price List is contained in our general STOCK LIST at 9d. including Haynes, etc. Components.

"PERSONAL SET" BATTERY ELIMINATOR

A complete Kit of parts to build Midget "Alldry" Battery Eliminator, giving approx. 90 volts and 1.4 volts.

This eliminator is for use on A.C. mains and is suitable for any 4-valve Superhet Receiver requiring H.T. and L.T. voltage as above, or approx. to 69 volts.



The Kit is quite easily and quickly assembled and is housed in a light aluminium case size 4½in. × 14in. × 3½in. Price of complete Kit with easy-to-follow Assembly Instructions **£5/5/-**.

In addition we can offer a similar COMPLETE KIT to provide approx. 90 volts and 1.4 volts. Size of assembled Unit 7in. × 2½in. × 14in. Price **47/6**.

"hundreds" of Wireless and Television Components and many KITS OF

ordering please include approx. cost of Post and Packing.

& 115 FLEET STREET, E.C.4

5812-3-4

£7-19-6

for a first-class **COMMUNICATIONS RECEIVER.** This is the famous ex-R.A.F. type R.1155, which is justly known as being a really top-top set. Covers 5 wave ranges, 18.5-7.5 Mc/s, 7.5-3.0 Mc/s, 1,500-600 Kc/s, 500-200 Kc/s, 250-75 Kc/s, and is easily and simply adapted for normal mains use, full details being supplied. These receivers have had some use, but are in very good condition, and are all aerial tested and guaranteed in working order before despatch. Also available :

Brand new, in maker's cases and aerial tested £11 19 6
Used, good condition, untested £6 19 6
Used, good condition, untested, less valves £5 0 0
Factory-Made Power Pack, Output Stage and Speaker, which operates the receiver immediately £5 10 0

Carriage costs of 10/6 for Receivers, 5/- for Power Pack, extra please.

SPECIAL REDUCTION OF 10/- IF POWER PACK AND RECEIVER ARE PURCHASED. Where used receivers are purchased, they may be exchanged for new ones within 14 days, you only pay the extra and carriage.

R.1355 RECEIVER. The very popular unit specified for "Inexpensive Television," a copy of which is supplied, complete with 8 valves VR65, and 1 each 5U4G, VU120, VR92. BRAND NEW IN MAKER'S CASES, ONLY **39/6** (carriage, etc., 7/6d.).

RF UNIT 24. For use with the above receiver, full details being supplied of simple modification necessary to cover all the T.V. stations. ONLY **25/-** (postage, etc., 2/-), OR

R.1355 COMPLETE WITH RF 24, ONLY **59/6** (carriage, etc., 7/6).

12-VOLT VIBRATOR UNIT. Delivers 300 volts @ 100 mA. Complete ready to use. Manufactured by Masteradio for the Admiralty, those are BRAND NEW IN ORIGINAL CARTONS ONLY **35/-** (postage, etc., 2/6).

I.F. STRIP TYPE 194. An easily modified I.F. Strip recommended for T.V. constructors who want good results at moderate cost, or for those who have built televisors but are having trouble in the vision or sound receivers. Can also be modified for 2-Channel working as per details in "Practical Television" October issue. This 6-stage strip measures 18in. × 5in. × 5in., and contains 6 valves : VR65, 1 of VR92, and 1 of VR53 or VR56. Mod. data supplied. BRAND NEW. ONLY **45/-** (postage, etc., 2/6).

INDICATOR UNIT TYPE 6. Contains 6in. C.R. Tube VCR 97, 4 valves EF 50, 1 of EB 34, and 1 of EA 50. The unit recommended for conversion to the "Wireless World" General-Purpose Oscilloscope, full details supplied (or available separately 1/-), ONLY **79/6** (carriage, etc., 7/6).

100 MICROAMPS METER. 2½in. Flush Mounting. Widely calibrated scale of 15 divisions marked "Yards," which can be rewritten to suit requirements. These movements are almost unobtainable to-day, and being BRAND NEW IN MAKER'S CARTONS are a "snip" at ONLY **39/6.**

50 MICROAMPS METER. 2in. Flush mounting. Another movement which is in short supply and is also BRAND NEW IN MAKER'S CARTON. ONLY **45/-.**

VCR 97 CR TUBES. All guaranteed tested full screen for Television use. In makers' crates. ONLY **45/-** (carriage paid).

6in. MAGNIFYING LENS FOR VCR 97 TUBE. First grade oil filled. ONLY **25/-** (postage 2/-).

TRANSFORMERS. Manufactured to our specification, and fully guaranteed. Normal Primaries.
425-0-425 v. 200 mA., 6.3 v. 6 a., 6.3 v. 6 a., 5 v. 3 a., 0-2-4-6.3 v. 3 v., 3 a. ONLY **72/6.**
425-0-425 v. 200 mA., 6.3 v. 4 a., 6.3 v. 4 a., 5 v. 3 a. ONLY **59/-.**
350-0-350 v. 160 mA., 6.3 v. 6 a., 6.3 v. 3 a., 5 v. 3 a. ONLY **42/6.**
250-0-250 v. 100 mA. 6.3 v. 6 a., 5 v. 3 a. ONLY **32/6.**
The above are fully shrouded upright mounting.
Universal Mounting 350-0-350 v. 80 mA., 0-4-6.3 v. 4 a., 0-4-5 v. 2 a. ONLY **18/6.**
Universal Mounting 250-0-250 v. 80 mA., 0-4-6.3 v. 4 a., 0-4-5 v. 2 a. ONLY **18/6.**
The following are upright mounting.
EHT for VCR 97 Tube 2,500 v. 5 mA. 2 v.-0-2 v. 1.1 a., 2 v.-0-2 v. 2 a. ONLY **37/6.**
EHT 5,500 v. 5 mA., 2 v. 1 a., 2 v. 1 a. ONLY **72/6.**
EHT 7,000 v. 5 mA., 4 v. 1 a. ONLY **82/6.**
PLEASE ADD 1/6 PER TRANSFORMER POSTAGE.

TRANSFORMER, for a variety of uses giving outputs of 3 v., 4 v., 5 v., 6 v., 8 v., 9 v., 10 v., 12 v., 15 v., 18 v., 20 v., 24 v., 30 v., at 2 amps. from normal mains input. ONLY **17/6** (postage 1/-).

TRANSFORMERS. Ex-W.D. and Admiralty, built to more than 50 per cent. safety factor, with normal A.C. Mains Primaries. All Brand New and Unused.
300-0-300 v. 200 mA., 5 v., 3 a., 6.3 v., 5 a., C.T., 20 v. 750 mA., 70 v. 100 mA. Weight 12 lb. ONLY **42/6** (postage, etc., 2/6).
330-0-330 v. 100 mA., 4 v. 3 a. Weight 7lb. ONLY **22/6** (postage 1/6).

Cash with order please, and print name and address clearly. Amounts given for carriage refer to inland only.

U.E.I. CORPORATION

Radio Corner, 138, Gray's Inn Road, London, W.C.1.
Phone : TERMINUS 7937

(Open until 1 p.m. Saturdays. We are 2 mins. from High Holborn (Chancery Lane Station) and 5 mins. by bus from King's Cross.)

1 KW TELEGRAPH TRANSMITTERS. Two HF 300's output. Operation 3.5 mc. to 16 mc.

RCA TRANSMITTERS. Type ET-4336. Complete with speech amplifier, crystal multiplier and VFO units. Unused and reconditioned. Can be supplied with very large quantity of spares.

RCA TRANSMITTERS. Type ET-4332 modified by R.A.F. for use on crystal or master oscillator. Complete with speech amplifier.

EX-R.A.F. 1143 TRANSMITTERS.

NAVY MODEL COLLINS TRANSCEIVERS. TCS9. Complete sets.

No. 12 TRANSMITTERS. With coupling units, remote control, etc.

A.R.88D's, A.R.88LF's, A.R.77's, S27's, HRO and others.

AUTOMATIC HIGH SPEED TELEGRAPH EQUIPMENT, "BOEHME" (U.S.A.). Up to 400 signs per minute on line and wireless.

NAVY MODEL TBY-8 TRANSMITTING-RECEIVING EQUIPMENT. Output 0.75 watts on M.C.W. telegraphy and 0.5 watts on telephony. Frequency range 28-80 mc.

All above items in excellent working condition.

Working demonstration upon request.

TX VALVES 803, 805, 807, 813, 814, 861, 866A, DET-16 and many others.

Large stock of Tx condensers, crystals and other components. Alignment and repair of communication receivers and all other short-wave equipment undertaken.

P.C.A. RADIO

Transmitter Division :—
The Arches, Cambridge Grove, London, W.6.
Tel. RIV 3279.

Receiver Division :—
170 Goldhawk Road, London, W.12.
Tel. SHE 4946.

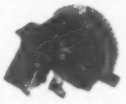
MAINS SIGNAL LAMP
LIST No. D.650

BULGIN RELIABLE RADIO & ELECTRONIC COMPONENTS ARE BACKED BY 25 YEARS, EXPERIENCE IN THE FIELD OF ELECTRONICS

BULGIN *Components*

A. F. BULGIN & CO. LTD., BARKING, ESSEX.

RELAYS AND KEY SWITCHES



LARGEST EX-GOVT. STOCK IN GT. BRITAIN

Types 600-3000 Relays — Siemens High Speed
Also A.C. 400 volts 50 cycles

Uniselector Switches, Telephone Switch-boards, Telephone Components, Plugs, Jacks, Handsets — **Government Contractors.**

JACK DAVIS (RELAYS) LTD. (Dept. W.)
36 PERCY STREET, LONDON, W.1
Phones : MUSeum 7960, LANgham 4821

Terms C.W.O. or C.O.D. No C.O.D. under £1. Postage 1/- extra under £1, 1/6 extra under £3.

RADIO SUPPLY CO.

15 Wellington Street, Leeds 1 Tel. 22153

Open to callers: 9 a.m. to 5.30 p.m. Saturdays until 1 p.m.
FULL PRICE LIST 5d.
TRADE LIST 5d.
Please enclose S.A.E. with all Enquiries

GARRARD AUTOMATIC RECORD CHANGERS TYPE R.C.70B. Single Speed type, complete with High Fidelity Magnetic Pick-up. Plate size 15½ × 13½in. Plays 10 or 12in. Records not intermixed. Limited number available at substantially reduced price of **£8 15 -** inc. tax. Carr. 5/-

COLLARO AUTOMATIC RECORD CHANGERS Latest 3-speed Type 3RC511, complete with Dual Purpose Crystal Pick-up for standard or Long-playing Records. Machine takes 9 records, 10in. or 12in., not intermixed. Overall size 15 × 12½in. Height above Motor Plate 4¼in., below 2¼in. **PRICE ONLY £11 11 -**, inc. tax. Carr. 5/- extra. (This is approx. 25% below current list price.)

SPECIAL OFFERS. Midget Mains Transformers (size approx. 2½ × 3 × 2¼in.). Drop-through chassis type. Screened Primary 220/240 v. 50 c/s. Output: 250-0-250 v. 60 mA., 6.3 v. 2.5 A. Only **10/9.** Small Filament Transformers, 220/240 v. input, 6.3 v. 1.5 a output, **5/9.** Auto Transformers (with separate t.t. 6.3 v. 1.5 a), 0-110-200-210, 230-250 v. 50 watts, **4/9** each. New Boxed Ex-Govt. Valves, VR126 (4 v. 7-pin H.F. Pentode), **1/9** each.

BATTERY SET CONVERTER KIT. All parts for converting any type of Battery receiver to All Mains. A.C. 200-250 v. 50 c/s. Kit will supply fully smoothed h.t. of 120 v. 60 v. or 60 v. at up to 40 mA., and fully smoothed l.t. of 2 v. or 1.4 v. at up to 1 a. Price complete with circuit, only **47/9**

H.T. ELIMINATOR AND TRICKLE CHARGER KIT. Consists of h.t. and l.t. transformer, h.t. and l.t. rectifiers, smoothing electrolytic, and choke, adjustable charger resistor. For Mains input of 200-250 v. Output 120 v. 40 mA and 2 v. ½ a. Price with circuit, **25/6.**

BATTERY CHARGER KITS.
To charge 6 or 12 v. acc. at 3 a., **29/6.**
To charge 6 or 12 v. acc. at 4½ a., **45/-.**
Above consists of transformer and bridge rectifier.

COAXIAL CABLE, 75 ohms, ½in. **11d.** yard.

DIAL BULBS, M.E.S., 6.5 v. 0.15 a., 8 v. 0.15 a., **6/9** dozen.

SELENIUM RECTIFIERS. 230 v. 50 ma., H.W. (small), **6/9.** 120 v. 40 ma., H.W. (small), **4/6.** 12-15 v. 2½ a. F.W. Bridge, **13/9.** 12-15 v. 4½ a., F.W. bridge, **18/9.**

ELECTROLYTICS (Current production. **Not** ex Govt.)

Tubular Types		Can Types	
8µF 350 v.	1/9	16µF 450 v.	2/9
8µF 450 v.	1/11	24µF 350 v.	2/11
8µF 500 v.	2/9	32µF 350 v.	4/3
16µF 350 v.	2/3	40µF 450 v.	5/3
16µF 450 v.	2/9	40µF 450 v.	5/3
16µF 500 v.	3/11	50µF 350 v.	4/9
24µF 350 v.	3/3	8-8µF 350 v.	3/9
32µF 350 v.	3/3	8-8µF 450 v.	3/11
8-16µF 500 v.	4/11	8-16µF 450 v.	4/6
25µF 25 v.	1/3	16-16µF 450 v.	5/3
25-25µF 25 v.	1/9	16-16µF 450 v.	5/3
50µF 12 v.	1/3	16-32µF 350 v.	5/3
25µF 50 v.	1/9	32-32µF 350 v.	4/11
50µF 25 v.	1/9	32-32µF 450 v.	5/11
50µF 50 v.	2/3	50-50µ350 vF.	5/11
250µF 12 v.	10d.		

CAN TYPES

32-32 8µF 350 v (Small)	5/11
16-16-8µF 475 v.	5/9
16-16µF 450 v. plus 20µF 25 v.	5/3
32-32µF 350 v. plus 25µF 25 v.	5/11
50µF 350 v. plus 250µF 12 v.	4/11

CHASSIS. 16 s.w.g. Undrilled Aluminum. Receiver Type 10 × 5½ × 2in., **3/9**; 11 × 6 × 2¼in., **4/3**; 12 × 8 × 2¼in., **5/3**; 16 × 8 × 2¼in., **7/6**; 20 × 8 × 2¼in., **8/11**; Amplifier Type, 12 × 8 × 2¼in., **7/11**; 16 × 8 × 2¼in., **10/11**; 14 × 10 × 3in., **12/6**; 20 × 8 × 2¼in., **13/6.**

SILVER MICA CONDENSERS. 5µµF, 10µµF, 15µµF, 20µµF, 25µµF, 30µµF, 35µµF, 50µµF, 120µµF, 150µµF, 180µµF, 200µµF, 230µµF, 300µµF, 330µµF, 400µµF, 470µµF, 500µµF, 1,000µµF (.001µF), 2,200µµF (.0022µF). All at **5d.** each. **3/9** dozen one type.

TUBULAR WIRE-ENDED CAPACITORS (New Stock): .001µF 7kV v., .01µF 750 v., .02µF 1,500 v. (large), .05µF 350 v., .1µF 350 v., .25µF 350 v., .5µF 400 v. All at **4d.** each, **3/3** dozen one type, **27/6** gross.

BAKELITE (Brown or White) and **WOOD** (Walnut veneered) **CABINETS.** Size approx. 12 × 6½ × 5in. Very attractive appearance. For illustration see our List. Supplied complete with fully punched T.R.F. 3-valve Chassis, back, 2 or 3 wave. Glass scale with coloured station names, Dial Backplate, **25/-**, plus Carr. 2/6.
All parts available for construction of T.R.F. or Superhet Receiver in above cabinets.

CLEARANCE LINES. 0005µF 2 gangs with short spindle, **4/6.** Vol. Controls, 1 Meg. Midget, with S.P. switch and long spindle, **2/9.** 25K with D.P. switch and 1in. spindle, **2/9.**

VOLUME CONTROLS with long spindles, all values less switch **2/9,** with S.P. switch **3/11.** **WIRE WOUND POTS.:** 20 ohms, 750 ohms, 5K, 20K, 50K (medium length spindles), **2/9.**

FOR CALLERS ONLY. Mains Trans., drop-through type with top shroud. Primary 230-250 v. Secs. 425-0-425 v., 200 mA., 300-0-300 v. 100 mA., 6.3 v. 2 a., 6.3 v. 2 a., 5 v. 3 a., **29/9.**

EX-GOVT. ITEMS. Pye coaxial plugs and sockets **7/6** doz. prs. Belling-Lee moulded type 5-pin and 10-pin plugs and sockets, **1/11** pr. Int. Octal Valve Screening Cans, 3 piece, **1/3** each, **11/9** doz. .02 mfd. 5,000 v. Tubulars, **1/9.** Coil Formers ¼in. with slug, **3/9** doz.

EX-GOVT. SMOOTHING CHOKES.

Potted Types	
350 mA. 5 H. 50 ohms	12/9
250 mA. 5 H. 50 ohms	10/9
150 mA. 10 H. 200 ohms	9/6
100 mA. 15 H. 200 ohms	9/6
50 mA. 50 H. 1,250 ohms	9/6
Tropicalised Types	
75 mA. 8 H. 200 ohms	4/6
50 mA. 50 H. 1,000 ohms	4/6

EX-GOVT. BLOCK PAPER MANSBRIDGE TYPE CONDENSERS

4µF 500 v. T.C.C.	2/-
8µF 500 v. T.C.C.	4/9

P.M. SPEAKERS. All 2-3 ohms. 5in. Plessey **13/9,** 5in. Goodmans **14/6,** 6½in. F.W. **14/11,** 6½in Goodmans **16/9,** 8in. Plessey **15/9,** 8in. Rola **17/6,** 10in. Goodmans **31/-,** 10in. Plessey **18/6.**

M.E. SPEAKERS. All 2-3 ohms, 4in. E.M.I. with trans. Field 700 ohms **14/9,** 6½in. Rola field 700 ohms, **11/9.** 8in. R.A. field 600 ohms, **12/9.** 10in. R.A. field 600 ohms, **19/9.**

R.S.C. MAINS TRANSFORMERS

Fully Guaranteed. Interleaved and Impregnated.
Primaries 200-230-250 V 50 c/s Screened.

TOP SHROUDED, DROP THROUGH

260-0-260 v. 70 mA., 6.3 v. 3 a., 5 v. 2 a. **14/11**
260-0-260 v. 80 mA., 6.3 v. 2 a., 5 v. 2 a. **14/11**
350-0-350 v. 80 mA., 6.3 v. 2 a., 5 v. 2 a. **17/9**
350-0-350 v. 90 mA., 6.3 v. 3 a., 5 v. 2 a. **21/9**
250-0-250 v. 100 mA., 6.3 v. 4 a., 5 v. 3 a. **23/9**
300-0-300 v. 100 mA., 6.3 v.-4 v., 4 a., c.t. 0-4-5 v. 3 a. **23/9**
350-0-350 v. 100 mA., 6.3 v.-4 v. 4 a., c.t. 0-4-5 v. 3 a. **22/9**
350-0-350 v. 120 mA., 6.3 v. 4 a., 5 v. 3 a. **26/9**
350-0-350 v. 150 mA., 6.3 v. 4 a., 5 v. 3 a. **29/11**
350-0-350 v. 150 mA., 6.3 v. 2 a., 6.3 v. 2 a., 5 v. 3 a. **29/11**

FULLY SHROUDED UPRIGHT

250-0-250 v. 60 mA., 6.3 v. 2 a., 5 v. 2 a., Midget type 2½-3-3in. **17/6**
350-0-350 v. 70 mA., 6.3 v. 2 a., 5 v. 2 a. **18/9**
250-0-250 v. 100 mA., 0-4-6.3 v. 4 a., 0-4-5 v. 3 a. **25/9**
250-0-250 v. 100 mA., 6.3 v. 6 a., 5 v. 3 a., for 1355 conversion **29/9**
300-0-300 v. 100 mA., 0-4-6.3 v. 4 a., 0-4-5 v. 3 a. **28/9**
350-0-350 v. 100 mA., 0-4-6.3 v. 4 a., 0-4-5 v. 3 a. **25/9**
350-0-350 v. 150 mA., 6.3 v. 4 a. 5 v. 3 a. **33/9**
350-0-350 v. 150 mA., 6.3 v. 2 a., 6.3 v. 2 a., 5 v. 3 a. **33/9**
350-0-350 v. 160 mA., 6.3 v. 6 a., 6.3 v. 3 a., 5 v. 3 a. **45/9**
350-0-350 v. 250 mA., 6.3 v. 6 a., 4 v. 8 a., 0-2-6 v. 2 a., 4 v. 3 a. for Electronic Eng. Televisor **67/6**
425-0-425 v. 200 mA., 6.3 v.-4 v. 4 a. c.t. 6.3 v.-4 a., c.t. 0-4-5 v. 3 a., suitable Williamson Amplifier **51/-**
425-0-425 v. 250 mA., 6.3 v. 6 a., 6.3 v. 6 a., 5 v. 3 a. **65/6**
325-0-325 v. 20 mA., 6.3 v. 0.5 a. 6.3 v. 1.5 a. for Williamson Preamplifier **17/6**

FILAMENT TRANSFORMERS

All with 200-250 v. 50 c/s. primaries: 6.3 v. 2 a. **7/6**; 0-4-6.3 v. 2 a., **7/9**; 12 v. 1 a., **7/11**; 6.3 v. 3 a., **10/11**; 6.3 v. 6 a., **17/6**; 0-2-4-5-6.3 v. 4 a., **16/9**; 12 v. 3 a. or 24 v. 1.5 a., **17/6**; 0-5-6.3 v. 5 a., four times, giving up to 24 v. 5 a. up to 12-6 v. 10 a., up to 6.3 v. 20 a. by series or parallel connections, **55/-.**

CLAMPED UPRIGHT MOUNTING

300-0-300 v. 100 mA., 6.3 v. 3 a., 5 v. 3 a. **21/9**
350-0-350 v. 100 mA., 6.3 v. 3 a., 5 v. 2 a. **21/6**

CHARGER TRANSFORMERS

All with 200-230-250 v. 50 c/s. Primaries: 0-9-15 v. 1.5 a., **14/9**; 0-9-15 v. 3 a., **16/9**; 0-9-15 v. 6 a., **22/9**; 0-4-9-15-24 v. 3 a., **22/9**; 0-9-15-30 v. 3 a., **23/9.**

SMOOTHING CHOKES

250 mA., 8-10 H., weight 12 lb. **16/9**
250 mA., 3 H. 50 ohms **8/9**
100 mA., 10 H. 200 ohms **7/6**
80 mA., 10 H. 350 ohms **6/9**
60 mA., 10 H. 400 ohms **4/11**
50 mA., 50 H. 1,000 ohms **9/11**
40 mA., 5 H. 150 ohms **3/6**
1 A., 25 H., .x. type **4/9**

ELIMINATOR TRANSFORMERS

Primaries 200-250 v. 50 c/s., 120 v. 40 mA. ... **7/11**
120-0-120 v. 30 mA., 4 v. ½ a. **12/9**
E.H.T. TRANSFORMERS. 2,500 v. 5 mA., 2-0-2 v., 1.1 a., 2-0-2 v. 1.1 a., for VCR97, etc. **37/6**

OUTPUT TRANSFORMERS

Midget Battery Pentode 66 : 1 for 3S4, etc. ... **3/6**
Small Pentode, 5,000Ω to 3Ω **3/9**
Small Pentode, 8,000Ω to 3Ω **3/9**
Standard Pentode, 5,000Ω to 3Ω **4/9**
Standard Pentode, 8,000Ω to 3Ω **4/9**
Multi-ratio 40 mA., 70 : 1, 45 : 1, 60 : 1, 90 : 1. Class B Push-Pull **5/6**
Push-Pull 10-12 Watts 6V6 to 3Ω or 15Ω ... **16/9**
Push-Pull 10-12 Watts to match 6V6 to 2-5-8 or 15Ω **16/9**
Push-Pull 15-18 Watts to match 6L6, etc., to 3Ω or 15Ω Speaker **22/9**
Push-Pull 20 Watts, high-quality sectionally wound, 6L6, KT66, etc., to 3, 7.5, or 15Ω (secondary in 4 sections of 3.7Ω each) **51/9**
Williamson type, exact to author's specification **65/-**

WE CAN QUOTE FOR QUANTITIES OF STANDARD OR SPECIAL TYPES. S.A.E. PLEASE WITH ALL ENQUIRIES.

C. MARKS & CO.

SPECIAL THIS MONTH!

POWER PACK, TYPE 285. Ground supply unit for the 1355 Rec. and 62 Indicator units. Input 230 v. 50 cps. Output E.H.T. 2 Kv. 3 mA. H.T. 220 v. 120 mA. L.T. 6.3 v. 10 amps and 6.3 v. 5 amps. Contains 3 mains transformers, 2 chokes, 3 1 mfd. 2.5 Kv. E.H.T. Condensers, 2 10 mfd. 450 v. block condensers, and one 4 mfd. 1,000 v. cond. VU120, 5U4G and EF50 valves, also usual layout of resistors, condensers etc. Price **£4**, plus 12/- packing and carriage.

104 I.F. STRIP. The well-known 13 mc/s I.F. strip for TV conversion. Complete with valves (4 Pentode and 2 crystal mixers), cover. **42/6**, plus 2/6 carriage.

RECEIVER, TYPE 18 CHASSIS (LESS VALVES). Covers 6-9 mc/s. Containing 465 kc/s I.F. Transformers, 7 gang tuning condenser, etc. Requiring only the 3 ARP12 and 1 AR7 valves, and batteries to operate. Slightly soiled. An absolute bargain at 10/-, post paid.

COLLARO GRAM MOTORS. Governor speed controlled (78 r.p.m.) motor. For A.C. Tappe 1 (for 110 v. and 200-250 v. Ideal for Tape Recorder work, drama etc. Brand new and boxed, 30/- each, plus 2/6 post and packing.

CRYSTAL MONITOR, TYPE 2. (Less valves and crystals). Useful chassis 11in. × 5in. × 3in. with cover. Contains 6-watt Variley on/off switch, indicator lamp holder large phone Jack Sockets, Resistors, Condensers, L.F. Choke and Transformer, etc. In strong wooden case, **6/6**, post free.

THE WELL KNOWN 1355 RECEIVERS. As used in the "Inexpensive Television." Brand new in original transit cases, **39/6**, plus 7/6 carriage.

TELEPHONE HANDSET (TA2036). For Tele P ones Mk. II. Brand new in original 12/6 each, plus 1/6 post.

144 MC/S TRANSMITTER (LESS VALVES). A compact TX Unit (10in. × 6in. × 4in.) covering 2 metre band. Valve Line-up, 2-6C4s as Push-Pull VFO, 832 amp. and 832 (or 829) final amp. Variable inductance tuning all stages. VFO coil is tuning. Can be used as TX. or driver, for larger TX. A snip at **21/-** each.

TV CHASSIS (Manufacturer's Surplus). Brand new. Size, 12in. × 16in. A complete TV set (sound, vision and time bases), can be built on this chassis. Fitted with M-Murdo type valveholders, 8-B6A, 3-B7G and 6 International Octals. An absolute bargain at **5/6**, plus 1/6 postage.

KAHOMOT (LOADED EBONITE). In the following sizes: 19in. × 36in. × 4in. thick, at 25/-, plus 2/6 carr. 19in. × 36in. × 1in. thick, at 35/-, plus 5/- carr.; 19in. × 36in. × 1½in. thick, at 40/-, plus 5/- carr. Also rods in the following sizes: 4in. dia. × 36in. long (useful for extension spindles, etc.), **4/6** per doz. plus 1/- carr.; 4in. dia. × 40in. long, 10/- each, plus 6/- carr.; 2½in. × 36in. long, 6/6, plus 3/- carr.

RECEIVER, TYPE 101. Containing CV66 Grounded Grid Triode, 2 VR136 (6SG7s), and VR137 (6SJ7) valves, a four-position Coil Turret. Has magnetic permeability tuned circuits. Covers 170 to 550 meg. 40 meg I.F. output. Outstanding value at 19/6 each, plus 1/6 post.

SMALL MAINS TRANSFORMER COMPLETE WITH METAL RECTIFIERS suitable for TV pre-amps, tuner units and test equipment. Power supply input 200 v. 50 cps. Output 300 v. 50 mA, 6.3 v. 1.4 amps. **13/6**, plus 1/6 postage.

HALF-WAVE MAINS TRANSFORMERS (slightly sub-standard). Input 200 v. 50 cps. Output 350 v. 50 mA, 6.3 v. 1.5 amps. A snip at 5/- each, plus 1/- post.

68 COMMERCIAL ST., NEWPORT, MON. Tele. 4711

also at **25 Wyndham Arcade, Cardiff**

All mail orders and enquiries to Newport branch please

RADIO EXCHANGE CO.

STROBE UNITS. With 6 EF50's, 5Z4, SP61, five EA50's, dozens of resistors, condensers, pots, relays, transformers, chokes, smoothing condensers, etc. Brand new. ONLY **59/6**.

RECEIVER P40. Complete with valves, tuning 85-95 mc/s, these are ideal for Wrotham or "2" metre conversion. Housed in attractive robust grey cases measuring 12 × 4½ × 5½in., these contain 4 EF54's (RF, mixer, Xtal multipliers), EC32 (Xtal oscillator), 2 EF39's (2.9 mc/s IF), EB34 (det.), 6J5 and 6V6 (audio). In original cartons, complete with circuit, **69/6**, post 1/6. Slightly soiled, **49/6**.

INDICATOR 182A. With VCR517 6in. tube, 3 EF50's, 6 SP61's, 5U4, 9 pots, resistors, condensers, etc. Ideal for television or 'scope. New in crates (less relay). **79/6**. A few, less 5U4 and EF50's, ONLY **50/-**.

BRAND NEW ACCUMULATORS in transparent, unspillable plastic cases. 7 A.H. 2 v., 3in. × 1¾in. × 4in., **6/6** (1/6 p.p.).

NEW 1355 CONVERSION. NEW EDITION of our data, for all 5 TV channels. Self contained, on ONE chassis, WITHOUT RF unit, **3/-**.

1355 RECEIVERS complete with 11 valves, BRAND NEW, in original cases, **45/-**.

1155 COMMUNICATION RECEIVERS, unused in original transit case (air tested) **£10 15/-**.

NATIONAL H.R.O. POWER UNITS, Providing 230 v. D.C. H.T., and 6.3 v. L.T., from 115-230 v. 50 cps. mains, these are ideal for the 1155 receiver, and are BRAND NEW in sealed cartons. Attractive black crackle cases measure 7½ × 7½ × 6½in. ONLY **50/-**.

HEMISPHERICAL CARBON MICROPHONES with switch, new, boxed, 5/-, post 5d.

MALLORY 4-PIN VIBRATORS. 12 v., non-sync. 5/- (post 9d.

14 ST. MARY'S STREET, BEDFORD

Phone: 5568.

Television · Radio · Record

CABINETS MADE TO ORDER

ANY SIZE OR FINISH

CALL OR SEND DRAWINGS FOR QUOTATIONS

B. KOSKIE

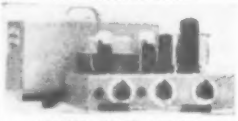
72-76 Leather Lane, Holborn, E.C.1

Phone: HOLborn 4771

PRATTS RADIO

1070 Harrow Road, London, N.W.10

(Nr. CRUBBS LANE) Tel.: LADbroke 1734



MODEL AC10E £10.7.0

AMPLIFIERS. College general purpose units. **MODEL AC10E,** 4 valve 10 watts. Neg feedback, **£10.7.0. MODEL AC15E,** 6 valve 15-watt P.P. output. Feedback over 3 stages, **£15.5/-. MODEL AC25E,** 25 watts P.P. output. Feedback over 3 stages, **£18.18/-. MODEL U10E,** for D.C./A.C. mains, 6 valve 10 watt P.P. output. Feedback over 3 stages, **£12.10.0.** All are complete with cases and chrome handles. They have a separate microphone stage. Separate inputs for mike and gram., allowing individual mixing, etc. Outputs match 3, 8 or 15 ohms speakers. Max. inputs volts required for full stated output average Mike .003, Gram. 3 v. **MODEL AC8C,** 5 valve P.P. 8-10 watt unit for records, radio, etc. Feedback over 3 stages. Outputs to 2, 8, 15 ohms. **£10.10/-. MODEL AC4C,** 3 valve record/radio amplifier, 4 watts to 3 ohms, **£5.15/-.** Units C/AC for DC/AC mains, **£5.15/-.** Stamp for list. Full range of accessories available including: Rothermel Crystal Mikes, **105/-;** Goodmans 12in. P.M. speaker, **£8.12.6;** Collaro A.C. Record Players, rim drive, magnetic model, **£6.9/-.** Crystal, **£6.15/-.** Jack plugs, 2/- each extra.

All amplifiers are complete and ready for use.

NEW LISTS

(ISSUED TO THE TRADE ONLY)

C&R3 52. "All about A.W.F. L/S Cone Assemblies" for repairs to speakers in your own workshops, and an up-to-date Repairs price list.

T4 52. "Full details of all components, etc., for the View Master" etc., giving the new nett and retail prices.

CL4 52. "Comprehensive Valve and Component List."

PRICE 3d. each (or 6d. the three). Post Paid in the U.K.

OVERSEAS AIR MAIL 2/- POST PAID.

A.W.F. RADIO PRODUCTS

TATLER CHAMBERS THORNTON ROAD

BRADFORD YORKS

Tel. 24008 Cables and Grams. "Testube" Bradford

THE WORLD'S GREATEST BOOKSHOP

FOYLES

FOR BOOKS

All new Books available on day of publication.

Secondhand and rare Books on every subject.

Stock of over three million volumes.

Subscriptions taken for magazines.

119-125 CHARING CROSS ROAD LONDON W.C.2

Gerrard 5660 (16 lines) ★ *Open 9-6 (Thurs 9-7)*

Nearest Station: Tottenham Court Road

Best Buy at Britain's

Scope for a Bargain!!!

SPECIAL OFFER OF

G.E.C. MINISCOPES

A single-beam cathode ray oscilloscope, specially designed for the radio, television and audio engineer, to achieve maximum versatility and compactness.

BRAND NEW in manufacturer's original cartons, with felt-lined leatherette carrying case complete with tube, valves, all leads and comprehensive INSTRUCTION MANUAL which includes 40 pages on the use of the 'scope by Miller. Send S.A.E. for illustrated pamphlet.

LIST PRICE £21

OUR PRICE—

£9.19.6

Plus 4/6 Carriage and Packing

★All usual controls—shift, sync, brilliance, focus, time base frequency, etc.

★ Hard valve time base. ★ Range 10 c/s to 50,000 c/s.

★ 2-stage amplifier for Y plates. ★ Attenuator.

★ For operation on A.C. mains 110 to 250 volts 50/100 c/s.

COMMUNICATION RECEIVER R1155 for world-wide reception. This set is recognised as one of the finest obtainable. For those not familiar with the receiver we can supply the authoritative "Wireless World" circuit and descriptive booklet for 1/3 post paid. All our receivers are air-tested before despatch and supplied complete with 10 valves. ABSOLUTELY BRAND NEW for **£11.19.6**, plus 10/6 carriage and packing, in original transit case. Demonstration given any time. Come and hear the receiver you buy.
Few only, slightly used, air tested at **£7/19/6**, plus 10/6 carriage, in original transit cases.
R1155N. A few of these models still available at **£17.19.6**, plus 10/6 carriage and case.

A.C. MAINS POWER PACK/OUTPUT STAGE enables the R1155 to be operated from 200/250 volts A.C. mains without any alteration whatever to the receiver. Just plug into mains and connect 2.3 ohm speaker (speaker not included). Manufactured by ourselves from first class components in a black case size 8½in. x 6½in. x 4in. Uses extra heavy duty transformer, 5Z4, 6V6 and output trans. Note that OUR power pack is GUARANTEED for SIX MONTHS. Complete with all valves, Jones plugs and leads for **£4.10.-**, plus 3/6 carriage.

££ SAVE MONEY ££

We offer brand new R1155, Power Pack/Output stage for only £15.19.6, plus 12/6 carriage (not model "N").

182A INDICATOR UNIT contains three EF50's, one 5U4G, four SP61's and a 6½in. Cathode ray tube, VCR517. This tube will replace the VCR97 without any alteration, is completely free from cut-off and has a more pleasant tube colour. The unit contains in addition a very large assortment of pots., resistors, condensers, etc. All tubes demonstrated to personal shoppers. This is the very best value obtainable to-day. Supplied **brand new** (less relay) for only **79/6**, plus 7/6 carriage, in original transit case. "Wireless World" 'scope leaflet supplied free with each unit.

A Merry Christmas
TO ALL OUR CUSTOMERS
PAST . PRESENT & FUTURE

MINIATURE MAINS TRANSFORMER.—Primary 230 volts 50 cycles. Secondary 230-0-230 volts 50 mA, 6.3 volts 2.6 amps. Suitable for small sets, instruments, etc. Upright mounting, size 2½in. x 2½in. x 3in. high. Price ONLY **10/-**, plus 1/- post. Brand new and boxed.

STANDARD MAINS TRANSFORMER. 200/230/250 volts 50 cycles. Secondary 325-0-325 volts 70 mA, 6.3 volts 2.5 amps, 5 volts 2 amps. Half shrouded, drop through, with mains panel. Size 4in. x 3½in. Brand new at **12/6**, plus 1/6 post.

R1294 RECEIVER.—This superhet receiver covers 10 to 60 cms. with continuous variable tuning. Local osc. E1231 with silicon crystal as first detector. I.F. of 13.5 Mc/s. Complete with all 9 valves and instruction manual. Price **£14**, plus £1 carriage and packing.

HRO POWER SUPPLY operates from a 6 volt D.C. source and supplies 165 volts at 80 mA, completely smoothed D.C. Uses Mallory Type 626 vibrator and 6X5 rectifier, 17 Henry smoothing choke, hash filter, etc. This is a really well made job, typical of the manufacturers of the HRO. Contained in a black crackle cabinet size 7in. x 7½in. x 6in. high. Supplied BRAND NEW in original packing for only **52/6**.

RCA SPEAKER.—An 8in. P.M. unit contained in beautiful black crackle cabinet, suitable for AR88, etc. BRAND NEW in original USA packing, price only **45/-**, plus 2/6 carriage.

R1355.—The receiver unit which is specified in the "Inexpensive T.V." book. Valve line up: 8—SP61, 1—VR92, 1—VU120 and a 5Z4. Brand new for **39/6**, plus 7/6 carriage in original transit case.

RF UNITS for the R1355 supplied modified to the T.V. frequency required. Any station, sound or vision for **32/6**, plus 2/6 carriage.

SPECIAL OFFER of brand new R1355 and RF unit tuned to frequency required for only **£3.10.-**, carriage paid. The cheapest way of making that T.V. set. The book "Inexpensive Television" supplied for **2/9**, post free.

E.H.T. TRANSFORMER for the VCR97, VCR517, etc. Mains input 230 volts 50 cycles. Output 2,500 volts 5 mA., 4 volts 2 amps, 2-0-2 volts 2 amps. FULLY GUARANTEED only **35/-**, post 1/-.

6in. MAGNIFYING LENS for the VCR97, etc. First grade, oil filled perspex. ONLY **19/6**, plus 1/6 post. Doubles your picture area.

100 MICRO-AMP METER. 2½in. flush mounting. Brand new in manufacturer's original cartons. The scale is calibrated in yards but can easily be re-written. Very scarce and an exceptional buy at **39/6**.

500 MICRO-AMP METER.—2in. square panel mounting. Brand new, original cartons, calibrated 0-500. Bargain at **15/-**.

CHARLES BRITAIN (Radio) Ltd.
11 UPPER SAINT MARTIN'S LANE
LONDON, W.C.2 *TEM 0545*
One minute from Leicester Square Station (up Cranbourn Street)
Shop Hours: 9-6 p.m. (9-1 p.m. Thursday). *Open all day Saturday*

UNIVERSAL ELECTRONICS

London's largest selection of high quality Communications Equipment, Laboratory Test Equipment and Recording Apparatus.

TEST EQUIPMENT.
AVO wide range signal generators, as new, **£33. AVO** Model 7's, as new, **£16. AVO** model 40, **£12 10 -. AVO** minors A.C. D.C., **£6 10 -. TAYLOR** 30 scope, as new, **£33. ADVANCE** signal generators, **£2, £32. COSSOR** Double Beam scopes from **£30. COSSOR** type 1035, as new, **£75. COSSOR** Telecheck, **£30. EVERSHED** Wee Meggers 500 v., **£11. EVERSHED** Bridge type 500 v., **£35.** 250 v., **£35. AVO** valve testers roller panel type, **£12 10 -. G.R.C.** Selectest meter, as new, **£15 10 -. WESTON** Industrial tester 20,000 OPV as new, **£25. RCA** wavemeters, type TE 149, 2.6 megs crystal, **£11.**

RECEIVERS.
RCA AR77E 550 kc/s to 32 Mc/s, good condition, **£37. AR88's HALLICRAFTERS** SX24, as new, **£35.** SX28, perfect, **£45.** S20R 550 kc/s to 42 Mc/s, **£25.** S38, **£35.** S41, **£30.** SX43, **£95. NATIONAL** NC100, **£30.** NC200, **£55.** RME69, **£45. HAMMARLUND** HQ120X, as new, **£45. HAMMARLUND** HQ129X, **£85.** German Army communication receivers. 250 A.C. 2.5 to 25 Mc/s, **£12** each. **NATIONAL** HRO Receivers 3nr. models, complete from **£30.** Manual for AR88D, LF, HRO Seniors CR100 527, SX28, RCA AR77E and others available at £1 7.6 per copy.

AUDIO EQUIPMENT.
LEAK TL12 and pre Amplifier as new, complete, **£26. BSR** 12 volt battery Amplifier, **£15. VORTEXION** 50 watt Amplifier, perfect, **£35. SCOPHONY BAIRD** Tape recorder, good condition, **£40. BSR** disc recorder with separate Amplifier, perfect, as new, **£70. DECCALIAN** 3-speed player, as new, **£27. TRIXETTE** Unit complete player, **£30.**

IN STOCK :—BENDIX BC 221 Frequency Meters. TS69AP wavemeters 300-1,000 megs. **LAVOI** frequency meter 430-700 megs. **MARCONI** TF390G, 144G, TF517F signal generators, and many other types of high-grade Laboratory equipment.

We wish to purchase, at your price, Spectrum Analyser TS148, Spectrum Analyser TSX-45E or TS.174, TS.175.

Shop hours : 9.30 a.m. to 6 p.m. Thursday to 1 p.m.

OUR ONLY ADDRESS Phone : GERard 8410 (Day)
DEPT. W. MEAdway 3145 (Night)

27 LISLE STREET, LEICESTER SQUARE LONDON W.C.2

G2AK *This Month's Bargains* G2AK

PARMEKO H.D. SHROUDED CHOKES. 8H at 250 mA. Weight 11 lbs. 16 6 each. Post and packing 1 6.
1,000 μF, 15 V. CONDENSERS, 2 6 each.
TWIN RIBBON FEEDER. Heavy duty 300 ohm, **5d.** per yd. Standard K25 300 ohm ribbon, **9d.** per yd. Co-axial cable, ¼in. dia. 50 ohm., **8d.** per yd., ⅜in. dia., 1 - per yd., 10 6 per doz. yds. 7ft. length ⅜in. dia. Co-axial with Pye plug one end, 1 6, post free. All other Co-axial and feeder, plus 1 6 post any length.
POTENTIOMETERS. Carbon Type Potentiometers, 25k., 50k., 100k., ½ meg., 2 meg., 1 6.
TRANSMITTING TUBES. Type 813 New and Boxed **£3 10 -** each. Type 866A., 17 6 each. 3E29 (8298), **£4** each. Few only.
METERS. 2½in. Flush mounting M.C. 100 m.a., 12 6 each ; 2in. Flush M.C. 5 m.a., 7 6 ; 0.5 amp. thermo., 8 - ; 4 amp. thermo., 8 -.
SPECIAL VALVE OFFER. Photocell Multipliers. Type 931A New and Boxed, limited quantity, **30 -** each.
JONES PLUGS. 8-pin, male and female, 1 6 per pair, 12 - per dozen pairs.
SHROUDED M.C. MIKE TRANSFORMERS. M.C. mike or line to grid, 8 - each. P. & P. 1 -.
M.C. Mike, Unshrouded, 2 -.
CARBON MIKE TRANS., 2 - each. P. & P. 6d.
COMPLETE SET OF AR88 TUBES (14) for LF or D Model receivers, **£5 10 -.**
TAPE RECORDING EQUIPMENT. Decks by Bradmatic, Tamsa, Lane and Qualtape. Ex. stock. Heads, Oscillator Coils, Tape and Reels always available.

SEND 1½d. STAMP FOR COMPREHENSIVE NEW VALVE LIST.

Carriage paid on all orders over £1 except where stated. Please include small amount for orders under £1.

Please print your name and address.

CHAS. H. YOUNG, G2AK

All callers to ***110 DALE END, BIRMINGHAM***
'Phone : CENTRAL 1635.
Mail orders to ***102 HOLLOWAY HEAD, BIRMINGHAM***
'Phone : MIDLAND

POLYTHENE
H. F. EQUIPMENT
(AMBYTHENE BRAND)
COIL FORMERS
CHOKES
STAND-OFFS
FEED-THROUGHS
Send for particulars and Samples
AMPLEX APPLIANCES (KENT) LTD.
19 DARTMOUTH ROAD, HAYES, BROMLEY, KENT
(RAVensbourne 5531)
All export enquiries to
ANTEX LTD., 3, TOWER HILL, LONDON, E.C.3.

VIEWMASTER COMPONENTS
Send for specific price list of items always in stock.

Radio and Television Components—large stocks held. Please send for our monthly bulletin, which always contains many exclusive bargain lines.

Loudspeakers 2½" to 12" Resistors • Autochangers • Record Players • Valves : Receiving & Transmitting • Transformers : Power, Filament & I.F. • Volume Controls • Condensers • Electrolytic Paper S.M. • Radiogram Walnut Cabinets • Plastic Radio Cabinets etc,

Trade only supplied.

V.E.S. WHOLESALE SERVICES LTD.
11 GUNNERSBURY LANE, W. ACTON, W.3
Telephone : ACOrn 5821

TELEVISION
for "Fringe" and "Long distance" viewers is vastly improved with the SPENCER-WEST type AC.3 Pre-Amplifier. The specification includes a first stage neutralised triode cathode coupled to a grounded grid triode. The optimum arrangement for best "noise factor". Self-contained power supply unit complete with correctly adjusted interference filter. Price complete, **10 gns.** from your dealer or direct. Leaflets, etc. on request.

WENVOE CONVERSION

Type AC.4 WL (Wenvoe London) and Type AC.4 WB (Wenvoe Birmingham) Convertor units for perfect simple conversion of your receiver. Price complete with 5 valves and self-contained power supply unit, **15 gns.** Descriptive leaflet on request.

SPENCER-WEST
QUAY WORKS, GT. YARMOUTH
Phone : Gt. Yarmouth 3069

WILL BUY any U.S. surplus radio parts, equipment

APN-9, TS-67, R-89B/ARN-5, ARC-1, ARC-3, ART-13, BC-221, BC-348, SCR-522, MN-53, MN-61, RA-1, MN-31, MI-32, ARN-7, Headsets, Mikes, Cannon Amphenol plugs, 274-N, ARC-5, Dynamotors, Test sets, "TS-" or "I-" prefixes.

State condition and Best Price

Aircraft Radio Industries, Inc,
85 St. John Street, New Haven, Conn., U.S.A.

MAINS TRANSFORMERS

These transformers are all famous radio manufacturers' surplus and are fully interleaved, impregnated and guaranteed.

Primary 200-250 v. P. and P on each, 1/6 extra.

350-0-350 100 mA., 4 v. 4 amp., 4 v. 2 amp., upright or drop-through, 16/-.

300-0-300, 100 mA., 6 volt 3 amp., 5 volt 2 amp., 25/-.

280-0-280, 80 mA., 6 v. 3 amp., 4 v. 2 amp., drop-through, 21/-.

Drop-thro' 350-0-350 v. 70 mA., 6 v. 2.5 amp., 5 v. 2 amp., 14/6.

280-0-280, semi-shrouded drop-through, 80 mA., 6 v. 3 amp., 5 v. 2 amp., 16/6.

Semi-shrouded, drop-thro', 280-0-280, 80 mA., 4 v. 6 amp., 4 v. 2 amp., 12/6.

Auto-wound, H.T. 280 volts at 360 mA., 4 v. 3 amp., 2 v.3 amp. or 6 v. 3 amp. Separates 4 v. 3 amp., rectifier winding (upright or drop-through), 10/6.

350-0-350, 120 mA., 4 v. 4 amp., 4 v. 3 amp., drop-through, 21/-.

Auto-transformer, various combinations of voltages including 110 v. 70 watts, and 3/4 volt windings at 1 amp., 2 volt 1 amp., drop-through or upright mounting, 10/6.

250-0-250, 60 mA 6 v. 3 amp., 12/6

250-0-250, 80 mA. 6 v. 4 amp., 14/-

Pri. 230 v. Sec. 200-0-200 35 mA. 6 v. 1 amp., 8/6.

Pri. 200/250 v. secondary 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24 and 30 volt at 2 amps., 13/-.

Heater Transformer, Pri. 230-250 v. 6 v. 1½ amp., 6/- ; 2 v. 2½ amp., 5/-, 2, 4 or 6 v. at 2 amps, 7/6, P. and P. each 1/-.

P.M. SPEAKERS (Closed field)

	with trans.	less trans.
2½in.	—	15/6
3½in.	—	13/6
5in.	16/6	12/6
6½in.	16/6	12/6
8in.	18/6	15/-

P. and P. on the above 1/- each. 10in., less trans. 25/-, P. and P. 1/6.

R. & A. 8in. M.E. Speaker field coil, 1,600 ohms O.P. trans. 5,000 ohms, impedance, 18/6. Post and packing 2/-. Rola 5in. P.M. with O.P. trans., 16/6.

6½in. Energised Television Speaker by PLESSEY. Field resistance 68 ohms with humbucking coil. Will pass up to 300 mA., require minimum 200 mA. to energise. These are cheaper than a T.V. choke. 9/6 each, 2 for 18/-.

Volume Controls, by famous manufacturer. Long spindle less switch, 50K, 500K, 1 meg., 2/6 each. P. & P. 3d. each.

B.T.H. Crystal Diode wire ends, 2/3, post paid.

Expanded aluminium speaker fret, 13½ x 9in., 2/-.

Volume Controls by famous manufacturer. Long spindle and switch, ¼, ½, 1 and 2 meg., 4/- each ; 50 K, 3/6 each Ganged control 3K and 5K, 3/6. Post and packing 3d. each.

Trimmers, 5-40 pf., 5d. ; 10-110 10-250, 10-450 pf., 10d.

Ceramic P.F.S. 3 each of the following: 330, 220, 180 and 82, 2/6.

Twin-Gang .0005 Tuning Condenser, 5/-. With trimmers, 7/6. P. & P. 1/-.

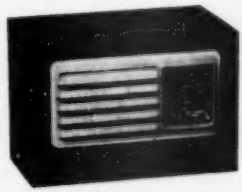
D. COHEN

RADIO & TELEVISION COMPONENTS

KIT OF PARTS FOR SIGNAL GENERATOR. Coverage 110 Kcs.–320 Kcs., 320 Kcs.–900 Kcs., 900 Kcs.–2.75 Mcs., 2.75 Mcs.–8.5 Mcs., 8.5 Mcs.–20 Mcs. Metal case 10in. x 6¼in. x 4¼in., size of scale 6½in. x 3¼in. 2 valves and 1 rectifier valve, AC mains 230 250. Internal modulation 400 cps. to a depth 30 per cent. Frequency calibration accuracy plus or minus 1 per cent. Modulated or unmodulated RF output continuously variable 100 millivolts. £3 10/-, P. and P. 4/-. This includes the return to us for checking and calibration. Circuit and point to point wiring diagram 3/6.

WALNUT BAKELITE CABINET size 17½ x 12 x 8in., complete with -wave band scale, size 8½ x 3½in., 5 valve superhet chassis with I.F., valve holder and transformer cut-outs, pointer, drum, drive spindle, 4 knobs, 2 scale clips, 3 pulley wheels, two brackets, scale pan and back. **DESPATCHED TO ENGLAND ONLY, 31/-**, post paid

CONSTRUCTOR'S POLISHED CABINET. Size 10 x 6½ x 5in. approx., supplied in flatted form, grooved and ready to glue together. Complete with plastic front, 3-valve chassis, size 8½ x 4 x 1½in., tuning scale, backplate and back. Illustration as it would look when assembled. Two knobs not supplied. 10/-, P. & P. 1/6.



TWIN-GANG AND PAIR OF TRF COILS with circuit to suit above, 8/6.

CRYSTAL PICK-UP by famous manufacturer complete with sapphire trailer needle and volume control, 23/-. Less volume control 21/-, post and packing on each 1/-.

EX-GOVT. RECEIVER TYPE 82B. Complete coil unit, 6 bands, 60 kc/s—420 kc/s., 500 kc/s—30 Mc/s. Complete with circuit, 19/6. Post and packing 2/- Circuit sold separately, 4/- post paid.

MAINS TRANSFORMER, semi-shrouded drop-through 200/250v. primary ; secondary 280-0-280 250 mA., 6 v. 6 amps., 5 v. 3 amps., 29/6. P. & P. 3/-.

WATERHOUSE 5in. EXTENSION SPEAKER, complete with vol. control, in gold and green, 22/6. P. & P. 1/-.

MAINS OR BATTERY SUPERHET PORTABLE COILS. Comprising medium-wave frame aerial and long-wave loading coil, used as aerial coils. Midget iron-cored screened L.H osc. coils, complete with circuit I.F. frequency 465 Kc., 9/6.

465 KC. MIDGET I.F.s. Q 120, size 1¼in. long, 1in. wide, ¾in. deep by very famous manufacturer. Pre-aligned adjustable iron-dust cores, per pair, 12/6. Both these items £1, post paid

CONSTRUCTOR'S PARCEL comprising chassis 8in. x 4in. x 1½in., with speaker and valveholder cut-outs, 5in. P.M. speaker with transformer, twin gang with trimmers, pair T.R.F. coils long and medium, iron-cored, four valveholders, 20 K volume control and wave-change switch, 23/- P & P 1/6.

OUTPUT TRANSFORMERS. Standard type 5,000 ohms imp., 2 ohms speech coil, 4/9 ; 42-1 speech coil 2-ohm with extra feed-back winding, 4/3 ; Miniature 42-1 2-ohm speech coil, 3/3. Multi-ratio 3,500, 7,000 and 14,000 2-ohm speech coil, 5/6. 10 watt push-pull, 6V6 matching, 2 ohm speech coil, 7/-.

Twin-gang .0005 with separate 75 pf. on each section for S.W. tuning with feet, size 3½ x 3 x 1¾in., 6/6.

Television Chassis : Size 9½ x 9½ x 3¼in., 18 gauge steel cadmium plated complete with 5-coil cans size 1½ x 1in. with iron-cored former. These are wound for television frequency. 6/6. P. & P. 1/6.

Push-back connecting wire. Doz. yds. 1/6 post paid.

Standard Wave-change Switches. 6-pole 3-way, 2/- ; 4-pole 3-way, 1/9 ; 5-pole 3-way, 1/9 ; 3-pole 3-way, 1/9 ; 9-pole 3-way, 3/6 ; Miniature type, long spindle, 3-pole 4-way, 5-pole 2-way, 4-pole 3-way, 2/6 each. P. & P. 3d.

Line Cord. 3-way 0.3 amp. 180 ohms, per yard, 1/3 per yard.

Television Coils wound in alsican, size 2½ x ¾in. with former and iron ore, 1/- each.

32 mfd., 350 wkg. 2/6
16 x 24, 350 wkg. 5/-
4 mfd., 200 wkg. 1/3
40 mfd., 450 wkg. 3/9
16 x 8 mfd., 500 wkg. 5/-
16 x 16 mfd., 500 wkg. 5/9
8 x 8 mfd., 450 wkg. 3/6
1 mfd., 500 v. wkg. 1/6
32 x 32 mfd., 350 wkg. 6/-
32 x 32 mfd., 350 wkg. and 25 mfd., 25 wkg. 6/6
2½ mfd., 25 wkg. ..... 11d.
250 mfd., 12 v. wkg. 1/-
16 mfd., 500 wkg., wire ends 3/3
8 mfd., 500 v. wkg., wire ends 2/6
8 mfd., 350 v. wkg., tag ends 1/6
50 mfd., 25 v. wkg., wire ends 1/9
10 x 6 x 2 x 2 mfd., 500 v wkg. 5/-
50 mfd., 250 v. wkg. 1/9
Ex-Govt. 8 mfd., 500 v. wkg., size 3½ x 1½, 2 for 2/6
60 + 100 mfd., 280 v. wkg. 7/-
16 x 32 mfd., 350 wkg. 6/-
50 mfd., 180 wkg. 1/9
65 mfd., 220 wkg. 1/6
4 + 4 + 4 mfd., 350 wkg. 2/6
8 mfd., 150 wkg. 1/6

Frame Oscillator Blocking Transformer, 4/6.

Frame O.P. Transformer, inductance 10 hy. ratio 10 : 1, 9/6.

Tube Mounting Bracket, size 9½ x 4½in., with 4¼in. dia. cut-out, in 18 gauge cadmium plated steel and 12in. tube clamps, 2/-.

Smoothing Choke, 2 henry 150 mA., 3/6

Smoothing Choke, 250 mA 4 henry, 5/- ; 250 mA, 5 henry, 6/-.

P.M. Focus Unit for Mazda tube, 15/-. P. & P. 1/6. Similar to above with front adjustment, 2/- extra.

P.M. Focus Unit for any 9in or 12in. tube, 35 mm. neck, except Mazda 12in., state tube 12/6.

Similar to above, but with front adjustment, 2/6 each extra

Ion Traps for Mullard or English Electric Tubes, 5/-, post paid

Pre-Aligned Midget 465 Kc. Q. 120, 9/- per pair, post 6d

465 Kc. I.F.s, size 2½ x 1¼in. Q.110 removed from American equipment, 5/- per pair

Iron-Cored 465 Kc Whistle Filter, 2/6.

Standard 465 Kc. I.F.S. Q.120, iron-cored, 3½ x 1½ x 1¼in. per pair, 9/6.

Television Masks White Rubber, 9in. with glass, 7/6. Cream rubber, 12in. with armour plate glass, 15/- ; 15in. white rubber mask, soiled, 12/6, plus 1/6 P. and P.

Valve Holders. Paxolin international octal, 4d. each. Moulded international octal, 7d. each. EF50 ceramic, 7d. each. Moulded B7G, slightly soiled, 6d. each. B8A, 7d. each.

Two-piece Octal Screening Can, 9d. P and P. 3d.

Three-bank, 50 pf., 1/3. Four-bank, 50 pf., 1/6.

AMPLIFIER CHASSIS, 18 gauge aluminium, 5 valve holders, transformer and 2 electrolytic cut-outs, size 11½ x 7½in., sloping front, 4/- each.

Twin Gang Midget .00037 with perspex, dust-cover and trimmers, 8/6. Post and pkg. 6d.

Mains Droppers, 0.3 amp., 460 ohms, tapped 280 and 410, 1/6 ; 0.2 amp., 717 ohms, tapped at 100 ohms, vitreous, 1/6 ; 0.3 amps., 950 ohms, tapped 700 and 825, 2/6 ; 0.2 amp., 1,000 ohms, vitreous, tapped, 2/6. Vitreous .3 amp 700 tapped 480, 640, 600, 3/6 P. and P. on each 3d.

3-gang .0005 with separate 75 pf. on each section for S.W. tuning with feet, size 4½ x 3 x 1¾in., 7/6.

Terms of Business : Cash with order. Despatch of goods within 3 days from receipt of order. Where post and packing charge is not stated please add 1/- up to 10/-, 1/6 up to £1, and 2/- up to £2. All enquiries and Lists. S.A.E.

SPECIAL NOTE : NO GOODS SENT WHERE CUSTOMS DECLARATION IS APPLICABLE.

23 HIGH STREET (Uxbridge Road) ACTON, W.3

Hours of Business : Saturdays 9—6 p.m. Wednesday 9—1 p.m. Other days 9—4.30 p.m. *Telephone : ACOrn 5991*

RECEIVER TYPE 1334. 18 valve Superhet, 20-60 Mc/s. and 135-175 Mc/s., complete with built-in A.C. power pack. £15/ carriage extra.
TEST EQUIPMENT B.C. 906, £3 ; B.C. 1066, £3 ; and 1-196-B, £3.
U.S. ARMY CABLE VULCANIZER KIT, £10. Carriage extra.
RECEIVER BC342. New condition, £25. Carriage extra.
VALVES. 154, 10/6 ; 6AG5, 10/6 ; 1172G, 12/6 ; 6SH7, 6/6 ; EF50, 8/6 ; 955, 954, 6/- ; SG215, 6/6 ; Pen 220A, 6/6 ; TT11, 8/6 ; VR150, 10/6 ; 42, 10/6.
RF24 UNITS. Converted to 28 Mc/s Band. Variable tuned with 100-1 geared S.M. Dial. Complete with plug and leads for immediate use. £3 5/-.
MAINS TRANSFORMERS. Input 200/240 v. Output 350-0-350 or 250-0-250 volt, 80 mA and 4 and 6.3 v. 4 a. and 4 and 5 v. 2 a. Price 21/6. Input 200/240 v. Output tapped 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24, 30 volts, 2 amps. 21/6. All with one year's guarantee.
NEW MINIATURE VALVES. CK512AX, 9/- ; 6AG5, 10/6 ; 9001, 9002, 9003, 7/6. 954-955, 6/6.
D.P.D.T. RELAYS. Operate at 200/300 volts D.C., 8/6. D.P. make and break, 8/6. We can supply any type of voltage and contacts at varying prices.
NEW SELENIUM RECTIFIERS. F.W. 12/6 volt 3 amps., 14/6 ; 4 amp., 16/- ; 6 amp., 30/- ; 1 amp., 10/6; 250 v. 120 mA. H.W., 9/- ; 12 v. 100 mA., 3/-.
10 HY. 120 mA. BRASS SHROUDED CHOKES, 7/6.
TYPE IN34—GERMANIUM CRYSTAL DIODES, 5/6.
POLAR—TWO-GANG VARIABLE CONDENSERS. .00015 mfd. Large quantity available. New offers please.
B.C. 603 RECEIVER AND B.C. 604 TRANSMITTER. 20 to 28 Mc/s. Including 80 Crystals, £35, carriage extra.
U.S. MANUALS for Test Equipment IE-56-A, SCR-729-A and SCR729AZ. Contains all the gen on Freq. Meter B.C. 906, Receiver B.C.1066 and Sig. Gen. 1-196-B. 21/-.
New and Boxed Type T.C.C. CP58QO, 1 mfd. 7 kV Condensers, 10/6 each. 1 mfd. 2.5 kV, 5/6.
VCR97 CRTs. New and crated. Picture tested, 45/6. Bases 3/6.
M.C. MICROPHONES with Matched Trans., 12/6.
NEW P.M. SPEAKERS. 5in., 14/6 ; 6in., 16/6 ; 8in., 20/- ; 10in., 29/6. Goodman 10in., 32/6 ; 8in., 18/6.
CARBON MICROPHONES with Matched Trans., 10/6.
ARCS RECEIVER 100/150 Mc/s. Now, £4 10/-.
All the above Post Paid from Dept. W.W.,

The RADIO & ELECTRICAL MART
253B PORTOBELLO ROAD, LONDON, W.11
Phone : PARK 6026

AMERICAN TRANSMITTER SPARES

We hold very large stocks of manufacturers' spares including:

SWITCHES
METERS
TRANSFORMERS
COILS
CONDENSERS
VALVES, etc.

Particularly for RCA Transmitters ET 4336 and Hallicrafter BC.610.
We shall be pleased to receive your enquiries.

THIS MONTH'S SELECTED ITEMS

METERS—FERRANTI Moving Coil Meters 0-500 micro-amps, Dia. 2½", Flush mounting. 45/- each.
HALLICRAFTER SX28 & RCA AR88 S Meters, 45/- each.
We wish to purchase large or small quantities of American transmitter spares or complete equipment.

McELROY-ADAMS MFG. GROUP LTD.
(Sole concessionaires U.K. for Hallicrafter Communication Equipment)
46, GREYHOUND ROAD, LONDON, W.6
Cable: Hallicraft London. *Phone: Fulham 1138/9*

AVOID BOTTLENECKS!

We hold large and comprehensive stocks of components and units. Contact us ; we may solve your production problem.

CONDENSERS. Silver Mica. Tubular. Mansbridge.
CRYSTALS. American FT241 & FT243 Etc.
HEADPHONES. DLR1, DLR5, IBAS Etc.
METERS. Thermo. Moving Coil. Moving Iron.
RESISTORS. High Stability. Carbon. Wire wound.
VOLUME CONTROLS. Morganite Types H, M, LH, BJ. Colvern 1-5 watts.
PLUGS & SOCKETS. Pye Patterns, Belling, etc.

Wholesale and Export Only.

ANDERS RADIO LTD.
167 HAMPSTEAD ROAD, LONDON, N.W.1
EUS. 1639 EST. 1929

LYONS RADIO LTD.

"PYE" 45 Mc/s I.F. STRIPS. Using 6-VR91's (EF50) and 1-VR92 (EA50) valves these units form a complete vision receiver having 4 R.F. stages: Detector, Video Amplifier and Phase Splitter. In new condition and complete with valves. **PRICE 22/6**, post 2/6. "Inexpensive TV." Contains conversion data, **2/6**, with above, or 2/9 separately.
R.F. UNITS, TYPE 26. These well-known converter units complete with all valves and in brand new and unused condition. **PRICE 52/6**, post 2/6.
DYNAMOTORS, TYPE D101. By the leading U.S.A. manufacturers. Size: 4½in. long × 3½in. dia. Max. input volts 27 DC, for 250 v. DC. output at 75 mA. **PRICE 10/6**, post 1/9.
ACCUMULATORS 2/12 VOLTS. Assembled in metal cases 8½ × 5½ × 6in., with carrying handle that folds flat when not in use. Rated at 12 v.-14 amp. hours. Connections from each cell terminate to a threaded stem so that it is quite easy to re-arrange connections to supply say 2 v. or 6 v. with, of course, a proportionate increase in amp-hour capacity. In good unused condition although outside of cases may be store soiled. Apart from radio uses seem very suitable for motor cycle or auxiliary car lighting etc. **PRICE 26/-**, carriage 4/-.
THIS MONTH'S SPECIAL OFFER
INDICATOR UNITS, TYPE 6. Fitted with cathode ray tube, type VCR97, suitable for scope or TV, 6-VR91's, 3-VR54's, Mu-metal screen, pots. and many other useful components. We can supply data for scope conversion for 9d., and "Inexpensive TV" giving TV data, 2/6. In good condition and C.R.T. tested to ensure freedom from cut-off. **PRICE 65/-**, carriage 6/6. (Data only add 3d. postage).

3 GOLDHAWK ROAD (Dept. M.W.), SHEPHERDS BUSH, LONDON, W.12. *Telephone :* **Shepherds Bush 1729.**

L. WILKINSON WHOLESALE AND EXPORT
19 LANSDOWNE ROAD, CROYDON
Phone : CRO 0d.N *Telegrams : "WILCO," CROYDON*

AVAILABLE FROM STOCK.

470	Contactors, American	12,000	yds. QUINCEL 7 Cable.
50,000	Glass Cartridge Fuses	6,000	Selenium Rectifiers
4,800	Glass Insulators	60,000	Pye Co-Axial Sockets
50,000	Potentiometers	1,000	Slydlok Fuses, 100 amp.
30,000	Valves	80,000	Telephone Jack Sockets
750,000	Resistors	42,000	ft. Capillary Tubing
250,000	Condensers	44	Signal Generators 20-88 M/cs.
30,000	Bronze Plugs and Sockets	100	Klaxon geared Induction Motors, 200/240 volts, 175 r.p.m., torque, 15lb. ins. No. IK58B3.W7, £10 each.
150	Portable Electric Blowers, 240 V., 250W.		
80,000	yds. UNICEL 4 Cable		
77,000	yds. UNICEL 19 Cable		
30,000	yds. TRICEL 4 Cable		

The above are a few items from our stocks. We can also supply P.O. Relays, type 3,000, built up to your requirements, Key Switches, Uniselector Switches, Sanson, Arrow, "Diamond H" Switches, Oak, etc., in many types. P.O. Standard 19 in. Racks, Tannoy 50 watt Rack-mounted Amplifiers, etc., etc. Lists now available.

NORMAN H. FIELD 49 HURST STREET BIRMINGHAM, 5
Mail Order Department
64-65 CHURCH LANE, WOLVERHAMPTON

CRYSTAL MONITORS. Type 2. For frequency checking of Transmitters and Receivers. Provision for phones. Battery Operated. Easily adapted for Mains use by using 5 Z3 valves. Housed in attractive cabinet, size 7½in. × 5½in. × 3in., with red panel indicator light. Less valves and crystal, 7/6. Circuit for conversion to mains, 1/-.
BATTERY AMPLIFIERS, A1366. Complete with VR35 and VR21 valves. For use as intercom, or with slight modification as Gram. Amplifier, in metal case, 7in. × 4½in. × 4½in. **15/-**.
In Carrying Case 1/6 extra. Full instructions and circuit for Modification, 1/- each.
METERS. Marked Air/Oil Moving Coil basic 200 Micro amps. Very Sensitive, 2½in. square. 7/6.
ROTARY CONVERTORS. Approx. 6 volts input and 270 v. at 60 m/a. Output. Postage 1/9. 12/6.
HAND MIKES. Tannoy Power. Carbon Type. With press-to-talk button, 3/6.
THREE-IN-ONE TRANSFORMERS. 6/- each plus postage 1/6. 230 v. 50 cycles Input 150-0-150 at 100 m/a. output. Useful for H.T. Eliminators and Low Voltage Power supply. Can also be used 350 v. half wave at lower current.
LOOP AERIALS. 1135. D.F., 8/6.
PRE-AMPS. Ultra S.W. uses EF54 with Coaxial input and output sockets. Also plug and socket for power supply. Broad Band. Slug tuned for use on T.V. frequencies or 10 metres. Valves to suit available. 5/-.
Please include something for postage. Money-Back Guarantee.

Henry's
RADIO COMPONENTS
ELECTRONIC & TELEPHONE EQUIPMENT

5 Harrow Road, Paddington, W.2

PADdington 1008/9 and 0401

OPEN MONDAY to FRIDAY 9-5.30, THURS. 1 o'clock, SAT. 6 p.m.

RADIO-GRAM CHASSIS

3 Wave-band Superhet. Med., long and short.

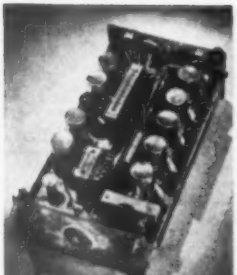
5 Latest Type MULLARD Valves.

4 Position Switching. Gram., Med., long and short.

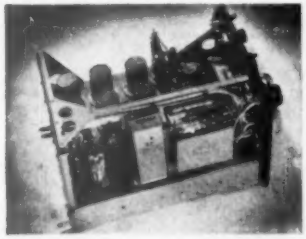
Also provision for Extension Speaker. A.C. Mains 110/250 volts.

Chassis 11"×7"×2½. Scale 8" Square.

PRICE **£10 . 19 .6** BRAND NEW AND GUARANTEED CARR. PACKING AND INS. 15/-



PYE 45 Mc/s STRIP. Special purchase of M.O.S. Type 3883 Units. Size 15in.×6in.×2in. Complete with 45 mc/s Pye Strip, 12 valves, 10 EF50, KB34 and EA50, volume controls and hosts of Resistors and Condensers. Sound and vision can be incorporated on this chassis with minimum space. New condition. Modification data supplied. Price £5, carriage paid.



STROBE UNITS. Brand New, in sealed cartons, these contain 6 EF50s, 5 EA50s, 1 SP61, a host of condensers, resistors, transformers, chokes, relays, switches, 7 pots and 3 smoothing condensers. Size 18in.×9in.×7in. Only 67/6, plus 5/- carriage.

No. 38 "WALKIE TALKIE" TRANSRECEIVER, complete with throat mike, phones, Junction Box and aerial rods in canvas bag. Freq. range 7.4 to 9 Mc/s. All units are as new and tested before dispatch. As supplied to Overseas police forces. £4.19.6, carriage 2/6.

TUNING CONDENSERS

2 gang .0005 standard ½ spindle, with trimmers..... 7 6
3 gang .0005 with ceramic insulation ¼ spindle..... 7 6
Midget two gang. .000375, with trimmers. Size 2in.×1¼in.×1¼in. Vanes enclosed in perspex.. 6 6
Midget .0005 mfd. 2 gang tuning condenser. Size only 2½in.×1¼in.×1¼in..... 6 6
Or with built-in trimmers 7 6
Two-gang Midget. .0005 with 4-way push-button assembly. Suitable for car radio etc..... 8 6

CONDENSERS. .1 mfd. 2,500 vw. metal, 2/6. Electrolytic 8 mfd. 450 vw., 2/6; 8×8 mfd., 4/-; 16 mfd. 450 vw., 3/6; 16×16 mfd., 450 vw., 5/-. All midget tubular cans, cardboard sleeves. 60 mfd.×40 mfd. 350 vw. size 4½in.×1in., 5/-. Block condensers 25×25 mfd., 50×12, 12×80, 1/6; 50×50 2/-. All new stocks, NOT surplus.

BOWTHORPE CONTINUITY METER. Dual scale 0-500 ohms and 100-200,000 ohms moving coil operated from 4½-volt internal battery. Size 6in.×3in.×4in. Original price £8/19/-. Our price, brand new £4/4/-

MOVING COIL METERS (Brand New):—

0-5 mA. square panel mounting, 2in. scale	7 6
0-50 mA. square panel mounting, 2in. scale ..	7 6
0-40 v. square panel mounting, 2in. scale	7 6
0-20 amps square panel mounting, 2in. scale ..	7 6
0-300 v. square panel mounting, 2in. scale	12 6
0-40/120 mA double reading round scale	12 6
2½in. round flush mtg., drilled flange:—	
Range 0/750 v. 200 ohms per v. Each	£1 2 6
Range 0/1500 v. 250 ohms per v. Each	£1 2 6
Range 0/3000 v. 200 ohms per v. Each	£1 5 0
0-1 mA desk type, 2½in. scale	£1 7 6

TRANSFORMERS-FILAMENT. All inputs 200/250 v. A.C.

Output 6.3 v. 1.5 am s	7 6
Output 6 and 12 v. 3 amps	£1 0 0
Output 6.3 v. 12 amps	£1 5 0

N.B.—Above voltages are when "on load."

L.T. RECTIFIERS

6 v. 1 amp G.E.C.	4 0
12 v. 2½ amp Westinghouse	12 6
12 v. 4 amp S.T.C.	£1 7 6
12 v. 8 amp S.T.C.	£1 12 6

S.T.C. RECTIFIERS E.H.T.

K3/25 650 v. 1 mA	4 7
K3/40, 1,000 v. 1 mA	4 0
K3/100 5,500 v. 1 mA	14 8
K3/200 10,000 v. 1 mA	£1 6 0

H.T. RECTIFIERS

S.T.C. 125 v. 60 mA	4 6
S.T.C. 175 v. 100 mA	5 0
S.T.C. 125 v. 125 mA	6 0
S.T.C. 250 v. 250 mA	18 0
S.T.C. 300 v. 75 mA	6 0

WESTINGHOUSE 14D/972,

250 v. 25 mA	6 6
S.T.C. H1/3 Noise Limiter	2 0

G.E.C. METER RECTIFIER, 1 mA.. 11 6

WEARITE

705 Coil Pack 3 wave band	£1 17 10
400B Min. I.F.T. 465 kc. pair	15 0
501 and 502 465 kc. pair	14 0
800s pair	15 0

RECEIVER R1355. As specified for "Inexpensive Television." Complete with 8 valves VR65 and 1 each 5U60, VU120, VR92. Only 55/-, carriage 7/6. Brand new in original packing case.

EF24, 25/-; EF25, 25/-; EF16, 5/6; EF27, 5/6. Owing to limited quantities, these units supplied only with R1355s.

CATHODE RAY TUBES:

VCR97. Guaranteed full picture. 40/-, carr. 5/-.
VCR517. Guaranteed full picture. 40/-, carr. 5/-.
Mu-Metal Screens for above 12/6 p.p. 1/3.
3BP1. Suitable for scopes. 25/-, carr. 5/-.

RECEIVER UNIT TYPE 159. Size 9in.×6½in.×4½in., containing VR91, VR92, CV66, VR65 and 24 v. selector switch. New condition, 15/-.

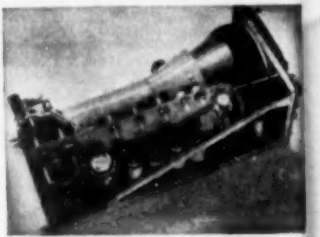
9in. ESCUTCHEON. Brown bakelite. Suitable plate glass and mask for 9in. tube. Price 7/6 each.

E.H.T. TRANSFORMER for VCR97. Input 230 v., output 2,500 v. 4 v. 2-0-2, 45/-.

EXPORT ONLY

4,000 prs. D.L.R. No. 5. 500 Brand New TR1196 Trans./Rec. In transit cases. 100 Trans./Rec. Type "46" with crystals and accessories. In canvas bags. 750 Walkie Talkies "38" with accessories. Large stocks of transmitting and special purpose valves.

E.H.T. TRANSFORMER for SCP1. Input 230 v., output 2,250 v. 6.3 v. @ .6 amp, 2-0-2 v., 45/-.



INDICATOR UNIT TYPE 182A. This unit contains VCR517 Cathode Ray 6in. tube, complete with Mu-metal screen, 3 KF50, 4 SP61 and 1 5U40 valves, 9 wire-wound volume controls and quantity of resistors and condensers. Suitable either for basis of television (full picture guaranteed) or Oscilloscope. Scope constructional circuit included. Offered BRAND NEW (less relay) in original packing case at 79/6. Plus 7/6 carr.

SPECIAL NOTE.—The VCR517 Tube has proved to be far superior to the VCR97 Tube (call for demonstration).

WALKIE-TALKIE TYPE "46" (case removed) complete with 6 valves, 2VP23, ML23, DD, QP23, TP26 and ATP4, aerial rods, I.F. trans., 1.6 mcs., mike trans. in new condition, but less transmitting components and coils removed by M.O.S., 35/-, carr. paid. (Less valves, 12/6).

VR91 (EF50). Red Sylvanian. Brand new original boxes U.S.A., 10/-; Silver, brand new original boxes, British, 8/6; red or silver on-suits guaranteed, 6/-; 6AT6, 12/6; 6A7, 12/6; 6J5, 12/6; VU111, VU120, VU120A at 5/-; EF50 at 3/6; PX25 at 10/-.

WE STOCK ALL TYPES OF STANDARD CATHODE RAY TUBES AND VALVES.

VIBRATOR PACKS

Input 6 v. Output 200 v., 60 m/a ...	30/-
Input 6 v. Output 150 v., 40 m/a ...	25/-
Input 6 v. Output 180 v., 40 m/a (Ex. 21 Set) ...	17/6
Input 2 v. Output 180 v./90 v., 35 m/a, 1.4 v., 250 m/a ...	50/-
Input 6 v. Output 200 v., 80 m/a (Masteradio) ...	25/-
Input 12 v. Output 300 v., 100 m/a ...	30/-

SEND STAMPS FOR NEW 1953 28-PAGE CATALOGUE

OUTSTANDING OFFERS FOR EXPORT ONLY

U.S.A. Radio and Radar Equipment

- RCA TRANSMITTERS, Type ET 4335-B, H, K, L.
- AIRCRAFT TRANSMITTERS, Model GO-9 (Westinghouse).
- RADIO SETS SCR-695. RECEIVERS AR-77 and 88.
- TEST EQUIPMENT IE-46, TS-36 AP, TS-56A AP, TS-51 APG-4, Type 205A, Type LR-1 (General Radio), BC-221 (Bendix) AN/UPM.
- Hallicrafters SCR-299, 399 and 499 (BC-610).
- RADAR Mk. 26 (Models 3 and 4).
- INTERROGATORS-RESPONSORS BM-1 (and BN-1).
- REPEATER-INDICATORS AN/APA-1.
- RADAR INDICATING EQUIPMENT, Model VF.
- AN/APS-3 Airfield Search RADAR.
- AIRCRAFT RADAR (complete units), APS-6.
- AN/APN RADIO ALTIMETER EQUIPMENT.

Spares (Radio and Radar-U.S.A.)

Full range of spares for most U.S.A. Aircraft, Naval and Ground Radio and Radar Units (SCR-187, 188, 193/269, 274-N, 287, 399, 508-10, 17, 536, 566, 593, 608-10 (very large quantities), 694, 695, MRN-3, TRA-1—ABK, BM, BN, SM, SO, SQ, SK, APS-2, 3, 4, 6, 15, etc.). Klystrons 2K33 (Oxford tubes).

- **British T.R.** (X 42, W/S No. 11, W/S No. 17, W/S No. 18 Mk. III, W/S No. 38, W/S No. 58, W/S No. 68-T).

Power Units, Wavemeters, Motor Generators, Dynamotors and large quantities of various components.

- **Aircraft Instruments and Accessories.**

Large selection of Bendix Instruments.
Aircraft Generators and Motor Assemblies. Oxygen Installations.
Individual Test Certificates and A.I.D. Certificates can be supplied upon request.

Enquiries to

BRITISH SAROZAL LTD.

(Export Branch)

1 BRISTOL HOUSE, SOUTHAMPTON ROW, LONDON, W.C.1

Telephone : HOLborn 6763/4/5 *Cables : Sarozal, London*

OVERSEAS BUYERS ARE CORDIALLY INVITED TO VISIT OUR WAREHOUSES, SHOWROOMS AND LABORATORY.

We buy for cash American surplus equipment.

ALEC Davis SUPPLIES Ltd

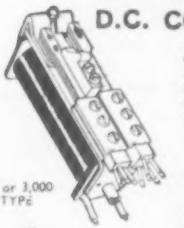
Dept. W.W.

18 TOTTENHAM COURT ROAD, LONDON, W.1.

Tel. : MUSeum 2453/4539

Business Hours : Monday-Friday 9—5.30 *Saturday 9 — 1*

RELAYS



600 or 3,000 TYPE

D.C. COIL RESISTANCE

3,000 TYPES : 1.9Ω to 80,000Ω
600 TYPES : 0.4Ω to 9,200Ω.

ALSO LARGE STOCKS OF DOUBLE & TRIPLEWOUND AND SLUGGED COILS.

SIEMENS TYPE HIGH SPEED

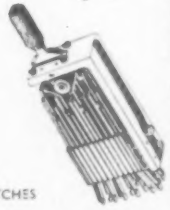
CONTACTS

3,000 TYPES : up to 8 sets.
600 TYPES : up to 4 sets.

3,000 TYPES : Make (M), Break (B), in Twin-silver Twin-platinum, Dome-silver (2 amp.), Tungsten (5 amp.), and Flat-silver (8 amp.). Change-Over (C), in all but Tungsten : Make-Before-Break (K), in Twin-silver and Twin-platinum.

600 TYPES : (M), (B) and (C), in Twin-silver and Twin-platinum.

KEY SWITCHES.
2 C/O. to 8 C/O. Special types made up to order.



KEY SWITCHES

SPECIAL.
Kit of parts less chassis for photographic timer unit, ¼ sec. to 100 secs.

TYPE RX/4

REFLEX CABINETS

Send for descriptive leaflet of this heavily built corner cabinet —size 37in. high and 29in. wide—ideal for best results with Goodmans, Wharfedale, etc. 12in. loudspeakers. Fully lined and beautifully finished in any shade of walnut, oak or mahogany. Early delivery. Rectangular and 10in. & 15in. models to order.

THE CHAFFEY CABINET CO.
60A CHELTENHAM ROAD, LONDON, S.E.15
Telephone : Orpington 3551

TRANSFORMERS

FOR ALL PURPOSES
SINGLY OR IN QUANTITIES FROM OUR STANDARD RANGE OR TO YOUR SPECIFICATIONS

GOOD DELIVERIES REASONABLE PRICES

We have also a department for rewinds giving you a 24-hour service and a better job. Please label all burnt-outs with your name and address when despatching.

P. HOWORTH
51 POLLARD LANE · BRADFORD
Tel. : 37030

ENGINEERS!

Whatever your age or experience, you must read "ENGINEERING OPPORTUNITIES." Full details of the easiest way to pass A.M.I.Mech.E., A.M.I.C.E., C. & G. (Electrical, etc.), General Cert., etc., on "NO PASS—NO FEE" terms and details of Courses in all branches of Engineering — Mechanical, Electrical, Civil, Auto., Aero., Radio, etc., Building, etc. If you're earning less than £12 a week, tell us what interests you and write for your copy of "ENGINEERING OPPORTUNITIES" today—FREE.

144 PAGES

Free!

B.I.E.T.
387 Shakespeare Hse. 17-19 Stratford Place, London, W.1.

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY

SOUND ENGINEERS TO LEEVERS-RICH THE FILM INDUSTRY

Lee Raser

WIPES WHOLE SPOOLS OF MAGNETIC TAPE INSTANTLY !

PRICE £7.10.0

TRADE ENQUIRIES INVITED.

LEEVERS-RICH EQUIPMENT LTD.,
37, WARDOUR STREET, LONDON, W.1. GER. 4532

Details of this
UNIT TELEVISION
are worth sending for!

Four completely wired, tested and reliable units give :— (1) Vision and sound, (2) Line time base, (3) Frame time base, (4) Power supply. Mounting for 9" or 12" tube optional.

These quickly assembled and adaptable units ensure successful operation at minimum cost. (The parts are not Government surplus, but newly made by a leading electronics company.)

Write now for further information.

UNITEL ELECTRIC 18, Avenue Road, Belmont, Surrey

Wireless World Classified Advertisements

Rate 7/- for 2 lines or less and 3/6 for every additional line or part thereof, average line 6 words. Box Numbers 2 words plus 1/-. Address replies Box 0000 c/o "Wireless World" Dorset House, Stamford St., London, S.E.1. Trade discount details available on application. Press Day: January, 1953 issue, Monday December 1st. No responsibility accepted for errors.

WARNING

Readers are warned that Government surplus components which may be offered for sale through our columns carry no manufacturers' guarantee. Many of these components will have been designed for special purposes making them unsuitable for civilian use, or may have deteriorated as a result of the conditions under which they have been stored. We cannot undertake to deal with any complaints regarding any such components purchased.

NEW RECEIVERS AND AMPLIFIERS

R1155, new built in P.P. and OP stage, separate t.s. and phones, carr. paid; £15, or nearest.—Box 3554 [9254

LEAK TL12 amplifier with RC/PA pre-amplifier, absolutely new; £30 or nearest.—Radio Development, 26, Queen St., Belfast. [9277

12-watt high quality amplifiers, bass and treble boots; £12/15; lists.—Broadcast & Acoustic Equipment Co., Ltd., Tombland, Norwich. [0065

TRIUMPH amplifiers offer a range of high grade amplifiers with remote tone controls for all purposes priced from £11/5 inclusive, also tuner units 4-valve with R.F. stage £11/5; fully guaranteed; prompt delivery.—Triumph Amplifiers, Liphook, Hants. [9332

BERNARD J. BROWN announces that he has joined the management of Leevers-Rich Maintenance, Ltd., where extensive facilities are available for the design and construction of amplifiers, sound recording equipment, including magnetic recorders.—80/82, Wardour St., W.1. Gerrard 4161. [0218

DELTA ELECTRONICS introduce the "dual-use" series of amplifiers for P.A. and high-fidelity reproduction of gramophone records; suitable for modern low-output pick-ups: 30 watt A.C., £16/15; 12 watt A.C., £14/15; 12 watt A.C./D.C. £13/5.—Delta Electronics, 42, Southwick St., W.2. Pad. 0681. [9520

RECEIVERS, AMPLIFIERS—SURPLUS AND SECONDHAND

E.E. TV, unused, complete all valves, c.r.t., £27.—2, Black Bull Rd., Folkestone. [9274

£9—New R1155 receivers.—R.W.S. Co., 69, Church Rd., Moseley, Birmingham. [9293

SOUND sales D.X. plus two, little used; £17.—Cromie, 1, Gledwood Ave., Hayes, Middx. [9265

£11—New R.1155 receivers, in cases.—R.W.S. Co., 69, Church Rd., Moseley, Birmingham. [7081

HALLICRAFTERS '38 communication receiver, first offer over £7.—2, Beech Grove, Hainault, Ilford, Essex. [9306

HRO Rx's and coils in stock, also AR88, BC348R, CR100, etc.—Requirements please to R.T. & I. Service, 254, Grove Green Rd., London, E.11. Ley. 4986. [0053

COMMUNICATION receiver by Vancouver Radio Laboratories, 19 valves, 1.4-29Mc, incl. Xtal calibrator, superb instrument; £50, o.n.o.—Griffiths, 62, Lynn Rd., Ilford, Val. 7593. [9260

15W quality P.P. amplifier, full tone (etc.) controls, power pack, used research only, £14; Lab. Audio Gen., 5c/s-20kc/s in 2 sweeps, sine/square attenuator C Follower o/p., built-in power unit, guaranteed, only £8; enquiries welcomed with s.a.e. please.—W. W. S., "Cleland," Ashtead, Surrey. [9271

NEW LOUDSPEAKERS

UNUSED Wharfedale W 10/cs; nearest £9.—Clarke, 12, Clough Lane, Werrington, Stoke, Staffs. [9316

LOUDSPEAKERS—SURPLUS AND SECONDHAND

GOODMANS Axiom 12, 15ohm, perfect, bargain; 5gns.—Box 5446. [9286

VOIGT domestic corner horn with twin diaphragm energized unit; £45 or nearest.—Wembley.—Box 5211. [9239

LIMITED number of unused Baker triple cone speakers 15ohms available at £5/5 12in model and £6/10 18in model; carriage paid passenger train; approximately half present prices.—Box 5532. [9330

VOIGT speaker in H.C. horn, immaculate condition and includes H.C. rectifier 250-240v, £50; specially built radiogram cabinet to take dual turntables, 4ft×1ft 6in×3ft, solid mahogany, £15.—Apply 62, Lichfield Rd., Sutton Coldfield. [9245

NEW DYNAMOS, MOTORS, ETC.

REGULATED power supply, 150-300v at 125 ma; £21/12.—Delta Electronics, 42, Southwick St., W.2. Pad. 0681. [9521

BATTERY chargers, 4 models 2-6-12v, 1-2-4 amp D.C.; any mains voltage; also larger types special transformers, chokes, test gear, interior car heaters, etc.—The Banner Electric Co., Ltd., Hoddesdon, Herts. [0122

The **P.1292 "HI-FI" OUTPUT TRANSFORMER**

From formulae to fine performance with faultless materials and faithful craftsmanship; thus another output transformer is created, a transformer for high fidelity reproducing or recording, and available at moderate cost.

With a leakage inductance figure of less than 15 mH, its electrical performance is such that this transformer can be recommended for use in most of the modern circuits employing a considerable degree of overall negative feedback.

The chief parameters are given on Technical Data Sheet No. 4, copies of which are available free on application.

Type P.1292, in two alternative styles, is available now from your usual radio dealer.

Potted style as illustrated £4/15/-
Unpotted style DN/404B £4/7/6

PARTRIDGE TRANSFORMERS LTD
BOSBECK ROAD, BURGESS HILL, SUSSEX

NEW DYNAMOS, MOTORS, ETC.

ALL types of rotating electrics, machinery up to 250kva available, including rotary converters, rotary transformers, motors, petrol and diesel-engined generating plants, alternators and d.c. generators. We are also in a position to quote for power transformers; as actual manufacturers we will be glad to quote for any quantity for home or export. [0039

DIESEL Electric generating plants, 3kva, 230v with push-button remote control, starting equipment, ready for use; £265.

ROTARY transformers, input 20v d.c., outputs 6.5v d.c. and 300v d.c., permanent magnet field, 20/-; ditto, input 24v d.c. and 1,200v 70ma d.c. output; energised field, 35/-; ditto, input 12v d.c., output 500v 90ma d.c., energised fields, 35/-; reasonable delivery.—Write CHAS. F. WARD, Lordscroft Works, Haverhill, Suffolk. Tel. 253. [0039

THE Pearce new model diesel alternator plant, on welded steel frame, 230/1,150 3kva 208 32v 15a d.c., Petters latest AVAL air-cooled diesel engine, alternator, self-energised automatic voltage control by winding on stator, at govern. speed 1,500 rpm, d.c. output trickle charges or charges lighting and starter battery up to 15amps, 24v lighting is used when plant is not in use; start and stop by remote control push-button; complete with main switch and fuses, battery cables, 24v 72 amp/hr batt, instruction book, spares; engine covered by Petters' inspection service £275, free delivery; where remote start and stop not required, but only push start on plant, reduction of £6/10; a few from stock, others quick delivery; if you collect or we deliver, battery is charged and a 10 cut ft concrete bed given free. SEND p.c. for full description and photographs. ALSO "AUTOMATIC" start & stop p'ants. Water-cooled "Petters" engine.

ALTERNATORS, four pole, 1,500 rpm, "press-button start," automatic voltage control without external equipment; type as fitted in above plant, 110/1/60 or 230/1/50 3kva wt 240lb, £72 del.; also 110/1/60 or 230/1/50 6kva wt. 400lb, £95 del.; 5kva, £77; 6kva, £102; f.o.b. Liverpool or London docks; please state direction of rotation at pulley end.

ALTERNATORS, 250/1/50, 500VA, self energised, 3,000 rpm, ball bearing £22/10 del.; also special television model, same price; voltage regulator 30/- extra.

TELEVISION, guaranteed interference free, special rotary converters, fitted radio and television filters, wt 400lb d.c. input, 12v 200w output, 24v, 50v 110v d.c. to 230v out, 250va, £25/10 del., with resistance converters run direct from lighting plant, also converters for radiogram and general use, inputs outputs and prices as above; the above also supplied without smoothing.

THE above are the latest products of British manufacture, and are guaranteed for one year; fullest details of plant, alternators or 400VA set or rotary converters, by return post; state which required; terms c.w.o., pro forma invoice c.o.d. (post goods only).

T. W. PEARCE, 66, Great Percy St., W.C.1 (near Angel). [0014

DYNAMOS, MOTORS, ETC.—SURPLUS AND SECONDHAND

12 large mercury rectifier bulbs, 3-phase, by Hewittic Elec., etc.; reasonable offer considered.—Pype Hayes Radio, 606, Kingsbury Rd., Erdington, Birmingham, 24. Tyc Erdington 4942. [9212

EX-W.D. unused rotary converters, 12 and 24v d.c. input, 230v a.c. output, with choke, condenser leak transformer, for 85watt sodium lamps, the whole enclosed in metal box, £5 to clear.—A. J. Philpott, Fountain Bo Fenton, Stoke-on-Trent. [9160

TRANSMITTING EQUIPMENT

TR1143A, TR1133H, T1151, T1000, T1403B offered.—R.W.S. Co., 69, Church Rd., Moseley, Birmingham. [7082

NEW TEST EQUIPMENT

ECONOMICAL power units, 250v 60ma, unstabilised, variable to zero, prov.; price £16/10; early delivery; larger types to follow; send for details.—Radiovisier, 377, High Rd., N.2 [0260

TEST EQUIPMENT—SURPLUS AND SECONDHAND

TAYLOR valve tester, portable, new condition; £10.—Greaves, 3, Mountview Rd., N.4. [9519

COSSOR 339 DB oscilloscope, nearest £30.—McDonald, 39, Diana Ave., Knightswood, Glasgow. [9252

AVO electronic testmeter, with 10kv multiplier, recently overhauled by makers, £30.—Bernard Woodmancy, Ltd., 18, Market Place, Prestwich. [9309

VARIAC (100L), 230v/0-250v 8 amps, brand new cond., £16/10 ea., carr. paid.—P. B. Crawshay, 16b, Pixmore Way, Letchworth, Herts. [0040

AVO electronic testmeter, latest model, new £40; three weeks use only; Avo all-wave oscillator; Furze-Hill A.F. attenuator; offers.—Box 5495. [9296

WINDSOR 30A oscilloscope, little used, very good condition; 47A portable valve tester, latest adaptors and charts, neither damaged or marked, £25 each or an offer.—Caine Radio, Petworth, Sussex. [9291

Raised any good masts lately? We have and on some quite serious ones. We're always solving tricky mast problems during the course of our daily diversions, and we thought that you might like to benefit from our experiences. Drop us a line and we'll gladly advise you on all problems . . . . this service is free, of course, and places you under no obligation.
Of course, we should add that with a Skymast there are less problems to be dealt with—firstly because each mast has been designed for its own application. Secondly because we have patented special erecting gear and thirdly we erect them ourselves if necessary. Why not write for further particulars . . .

SKY-MASTS

BEADON GARAGE, BEADON RD., LONDON, W.6. Phone: RIVerside 1124

MINIATURE SWITCHES

for constructors and engineers

by

ARROW

ARROW offer you a special range of miniature switches at competitive prices. Look in your local dealer's window for the Arrow Display Box showing 10 different types or ask him to get you full particulars of the switch you want.

Insist on ARROW switches and get the best results.

ARROW ELECTRIC SWITCHES LTD. HANGER LANE · EALING · W.5

TEST EQUIPMENT—SURPLUS AND SECONDHAND

EDDYSTONE 840 receiver, £23 or nearest; Cossor oscilloscope 339 and ranging oscillator 343, £35.—Apply Graham Newtery, Axminster. [9289

MARCONI CR2 Console oscilloscope, less 4 valves and tube, complete with A.C. power pack; best offer to—Mail Order Supply Co., 35, Tottenham Court Rd., London, W.1. [9315

BRIDGE-MEGGERS by E. & V. Ltd. 0-10ohm to 50 megohms, self-contained, 250v. accuracy tested; each, in leather case, £21.—P. B. Crawshay, 166, Pixmore Way, Letchworth, Herts. [9259

ELECTROSTATIC condenser 225 UF, 25,000 volts D.C., in oil; also H.F. alternators, 6kw, 25amps, 1,500 cps, motor driven; also Du Mont oscilloscopes.—E.W.S. Co., 69, Church Rd., Moseley, Birmingham. [9292

SIGNAL generators, oscilloscopes, output meters, valve voltmeters, frequency meters, multi-range meters in stock; your enquiries are invited.—Requirements to R.T. & I. Service, 254, Grove Green Rd., London, E.11. Ley. 4998. [0086

NEW GRAMOPHONE AND SOUND EQUIPMENT

IN stock.—Wearite tape decks; £35.—Austen, 28, Valebridge Rd., Burgess Hill. [9210

TRUVOX tape decks, 22gns, from stock, and parts for Sound Master.—Purkis, 20, Park Rd., South Wanstead. [9310

TAPE recorder motors, 250v a.c., powerful, quiet, brand new, 15/11, post, etc., 1/1.—K. W. Logan, Westalley, Hitchin, Herts. [9252

MAGNETIC tape recording heads, complete with tape guide, Mu. metal screened, single pin fixing, 22/6, postage 1/-; why pay more; trade enquiries invited.—E.M. Developments, 50, Grove Lane, Handsworth, Birmingham. [9276

9Kcs whistle can be attenuated with a high Q toroidal coil fitted as series or parallel resonant cct; easily adjusted aurally, coil only, 15/-; can be used also as inductance standard, accuracy 2%.

BEL SOUND PRODUCTS Co., Marlborough Yard, London, Archway, N.19. [0187

TAPE R/P amplifiers to suit new Truvox desk, from 12gns; others to suit Lane, etc., 8 watts, p.-pull, 12gns; Super 12 watt, 16gns; also kits wired and assembled expertly, app. 45/-; all amplifier repairs promptly dealt with.—HARDING ELECTRONICS, 120a, Mora Rd., London, N.W.2. [9178

TAPE recorder (Unitbilt), pars.: power-drive unit H.D. fan-cooled motor, heavy balanced flywheel, in special bearings mounted in cast alloy frames, 3-hole fixing to panel front speed change 3¾-7½in sec, £6 delivered, plus £1 deposit on packing; control head unit 1-hole fixing cam unit interlocked for motor, stop, rewind, etc., 55/-; pot core oscillator coil, with tags, 10/-.

ALSO equaliser pre-amps with EF40, amplifier parts, complete amps; s.a.e. for leaflets.—MIDLAND Radio Coil Products, 28, Winstanley Rd., Wellingborough. [0224

GRAMOPHONE AND SOUND EQUIPMENT —SURPLUS AND SECONDHAND

TAPE recording deck Clifton, in good condition; £10.—Tel. Hop. 0495. [9295

H.M.V. Electrogram model 3,000, cost £398/18, condition as new, £120; also Vought domestic corner horn with P.M.2 unit, £57/10.—The Elms, Warham Rd., South Croydon. [9326

M.S.S. portable disc recorder, £40; Leak amplifier matched for above, £32; Vitavox microphone and stand, £10; Wearite tape deck, £28; all guaranteed perfect.—Box 3513. [9309

MAGNETIC recorders; all types of magnetic recorders bought, sold, hired and exchanged; comprehensive repair service; mechanical and electronic repairs carried out by specialists; Magnesgraph Limpet telephone pick-ups, 25/-.

THE MAGNEGRAPH RENTALS Co., 1, Hanway Place, Oxford St., W.1. [0236

B.S.R. disc recording unit for sale, amplifier, cutting table, play-back speaker, 2 microphones, etc., in leather carrying cases, new condition; £100.—Can be seen at S. J. Short, Cine and General, 17-19 Upper Maudlin St., Bristol, 2. [9231

PROFESSIONAL studio disc recording equipment, used twice only, M.S.S. manufacture, twin turntables, two "Standard" microphones, storage cases, cost over £400 new, can be inspected; £200.—Danceland, 76, Southwark St., London, S.E.1. [9235

PUBLIC address equipment, Philips type 2857(R), quarter Kilowatt output, microphone, record player, twenty 8in loudspeakers and two unused DA 100 output valves; cost £250, bargain at £120.—Electrical Officer (Radio), R.N.A.S., Ford, Arundel, Sussex. Tel. Littlehampton 720. [9244

WORK WANTED

ASSEMBLY, wiring, special equipt.; audio specialist; private or trade.—Radiovimier, 577, High Rd., N.2. [0219

NEW COMPONENTS

GOLD aluminium speaker mesh, 12in square, 4/6.—Bullock, The Ridge, Pant, Oswestry. [9259

RESISTORS, condensers, potentiometers and other items for sale; this year's delivery; list available.—BR816295, 212, Stanhope Drive, Horsforth, Leeds. [9307

RADIO coilpacks, short-wave kits, television components, speakers, valves, pickups, new catalogue free.—Radio Equipment Company (Dept. W.W.), Castor Rd., Brixham, Devon. [8603

RADIO COMPONENTS — SURPLUS

New and Unused—Trade Offers

SWITCHES. All one-hole fixing. Yaxley types, 2 bank, single pole, 6 way double spaced, no stop (switch to be drilled for this. 15/- doz. Smaller type, 3 bank, 2-pole, 6-way, total of five poles only, 15/- doz.

SLEEVING. High voltage ex-Govt. 2 mm., black, 5/-, 100 yds. 2½ mm., black, 8/-, 100 yds. 4 mm., blue, 6/9, 100 yds. Perbraid, black, 3 mm., per gross 6/-. Varnished cambric 4 mm. brown, this slightly flattened but electrically sound, 7/6 gross.

TRIMMERS. 25 mm., preset with lockNut, on ceramic, boxed singly, cellophane wrapped, 30/- gross, postage 4/-; ditto loose, cellophane wrapped, 18/- gross.

VITREOUS RESISTORS. L.T. types, 23 ohms tapped, 4 ohms, no tags, 3.5/9 tapped, 6/9 doz.; 3 doz. 15/-; per gross 48/-.

SLIDING RESISTORS on stand, worm drive, 25 amps 0.4 ohms, parallel wound, can be 0.8 ohm by slight alteration, 8/9 each.

CONDENSERS. Upright with feet, 1 mf. 500 v., 6/- doz. 5+3 350 v. N.L., heavy terminals, 4/6. 11+7 350 v. N.L., all filled, extra heavy terminals at side 8/6 each. Mica moulded 0.004 mf., 1,250 v. wkg., 20/- gross, all perfect insulation.

FILTER BOXES. Metal with fixing bracket, baseswitch, cond. and res. co-axial input and output, in open ended cartons, 8/- doz. P.P.

VARIABLE CONDENSERS. 4-gang straight type, slightly soiled, 6—8/- P.P., or perfect 8/- each, plus post.

Terms C.W.O. or C.O.D. Full list on request.

See classified columns for resell offers.

G. A. RYALL, "UTOPIA," MAYFIELD ROAD, HERNE BAY, KENT

SOUTHERN RADIO'S WIRELESS BARGAINS

TRANSMITTER-RECEIVERS (Walkie-Talkie). Type 38 Mark II. Complete with 5 valves, microphone, 'phones, aerial, etc. Guaranteed ready for the air. Less batteries £4/12/6, plus 2/6 post.

TRANSMITTER RECEIVERS. Type 38 Mark III. Later model, complete. Crystal controlled, £8/10/-.

TRANSMITTER RECEIVERS. Type "18," 6-9 megs. Perfect £7/10/-.

RECEIVERS R109. Complete with enclosed speaker and vibrator pack for 6 volts. Complete with 8 valves, in metal case, £7/15/-, plus 7/6 carriage.

MINISCOPES, TYPE MS6B (G.E.C.). MINIATURE CATHODE RAY OSCILLOSCOPES, 1½in. C.R Tube. Time base, etc., etc. Brand new, in maker's sealed cartons. With leatherette carrying case.

LUFBRA HOLE CUTTERS. For use on wood, metal, etc., etc. Adjustable from ⅜in. to 3¼in., 8/9.

THROAT MICROPHONES. Complete with Long Lead and Plug. Magnetic, 4/6.

PLASTIC TRANSPARENT MAP CASES. 14in. by 10½in. Ideal for Charts, Photos, Display, etc., 5/6.

STAR IDENTIFIERS. With hydrographic office mods. A-N type. New in cases, 5/6.

WESTECTORS. WX6 and W112, 1/- each; 11/- per dozen.

MARCONI AERIAL FILTER UNITS. Type "916" P.O. Specification. Full fixing instructions, 4/6.

AERIAL COUPLING UNITS. Type "C." New, complete in metal carrying case. With Meter, Variometer, etc., etc., 10/6.

CONTACTOR TIME SWITCHES. 10-hour movements. 2 impulses per second. Thermostatic control. New in sound-proof case, 17/6. Remote Controls for above, 7/6.

CONTROL CABLES, for Command Receivers, R.C.453/4/5. 14 feet with adaptors at either end, 10/-.

Full List of Radio Books 2½d.

HUNDREDS OF FURTHER ITEMS FOR CALLERS

SOUTHERN RADIO SUPPLY LTD., 11, LITTLE NEWPORT STREET, LONDON W.C.2. *GERrard* 6653

TELE-RADIO
(1943) LIMITED

177, EDGWARE RD., LONDON, W.2.

Phone : PAD. 5606, PAD. 6116.

Shop Hours : Monday—Saturday, 9 a.m.-6 p.m. Thursday, 9 a.m.-1 p.m.

WEARITE TAPE DECKS £35 0 0
Oscillator Coils 5 6
Improved deliveries. Inquiries invited.
LEAK "POINT ONE" AMPLIFIERS £28 7 0
"VARI-SLOPE" PRE AMPS. £12 12 0
TAX FREE SPEAKERS—
Goodmans Audiom 60 ..... £8 12 6
Vitavox K12/20 ..... £11 0 0
18 S.W.G. ALUMINIUM CHASSIS—
8in. x 6in. x 2in. 6 9
8in. x 6in. x 2½in. 7 6
12in. x 6in. x 2½in. 8 6
14in. x 10in. x 2½in. 11 0
17in. x 10in. x 2½in. 12 6
17in. x 10in. x 2in. Steel 10 6
17in. x 10in. x 3in. Steel 12 6
ROGERS MINOR, with pre amp. £11 0 0
ROGERS BABY, with pre amp. £18 10 0
CONNOISSEUR 3 SPEED MOTORS £23 13 0
DENCO I.F. ALIGNMENT OSCILLATOR (465 and 1600 kcs) £2 19 6
DENCO DUAL RANGE T.R.F. COILS, pair 8 0

OAK SWITCHES.

WE SPECIALISE IN ASSEMBLING OAK PAXOLIN AND CERAMIC SWITCHES TO INDIVIDUAL REQUIREMENTS. QUOTATIONS BY RETURN OF POST. DELIVERY 2/3 DAYS.

ELLISON MAINS TRANSFORMERS
(All upright mounting).

Type MT142. Pri. 200 v., 220 v., 240 v. Sec. 250-0-250 v. 60 mA., 5 v. 2 a., 6.3 v. 3 a. £1 3 3
Type MT121. Pri. 200v .. 220 v., 240 v. Sec. 350-0-350 v. 80 mA., 5 v. 2 a., 6.3 v. 3 a. C.T. £1 8 6
Type MT137. Pri. 220 v., 230 c , 240 v. Sec. 250-0-250 v. 120 mA , 5 v. 3 a., 6.3 v. 7 a. £1 13 9
Type MT198. Pri. 200 v., 220 v., 240 v. Sec. 350-0-350 v. 120 mA., 5 v. 5 a., 6.3 v. 5 a. C.T. £2 1 3
Type DT199. Pri. 210 v., 230 v., 250 v. Sec. 350-0-350 v. 120 mA., 0-4-5 v. 3.5 a., 4 v. 5 a. C.T., 6.3 v. 5 a. C.T. £2 1 3
Type TV21. Pri. 210 v., 230 v., 250 v. Sec. 2.5 kv. 5 mA., 2-0-2 v. 4 a., 4 v. 2 a. £2 8 6
Type T238. Pri. 200 v., 220 v., 240 v. Sec. 350-0-350 v. 250 mA., 0-2-4 v. 2 a., 0-4-5 v. 3 a., 6.3 v. 6 a., 4 v. 8 a. £4 10 0
Type FT31. Pri. 230 v. Sec. 6.3 v. 1.5 a. 9 0
Type T68. Pri. 210 v., 230 v., 250 v. Sec. 0-4-6, 3 v. 4 a. 19 6
Type SP78. Pri. 210 v., 230 v., 250 v. Sec. 12 v tapped 6.3 v. 3 a. £1 1 9

ELLISON L.F. CHOKES—
TC75. 30 H., 20 mA., 500 ohms ... 10 6
SP76. 10 H., 150 mA., 85 ohms ... £1 7 9
TC38. 5 H., 250 mA., 50 ohms ... £1 9 3
LP68. 10 H., 60 mA , 400 ohms ... 6 9
TC37. 10 H., 80 mA , 200 ohms ... 12 9

PLEASE ALLOW FOR POSTAGE AND PACKING. C.W.O. or C.O.D.

NEW COMPONENTS

"VIEWMASTER" television, Plessey scan coils, 21/-.—Jack Porter, Ltd., 30/31, College St., Worcester. [0045

TELEVISION.—All coilsets for home-built TV, latest, 8ch canned formers; 2/5; trade supplied.—BEL, Malborough Yard, N.19. [0185

NEW 5-waveband prealigned coilpacks (L.M.S.). 22/6 each; c.w.o.; trade enquiries invited.—Simpkins, 38, Dulebury Rd., London, S.W.17. [0203

COILS.—Potted coils, very high gain, m/wave, 16/6; potted kit for 1FTs, with instructions Q over 250, 50/-; tuner coils, lowest loss pair, m/wave or lw, 8/6.—BEL, Marlborough Yard, N.19. Arc. 5078. [0184

CRYSTAL microphone inserts (Cosmocord Mic 61, guaranteed brand new, 15/6 post free; Cosmocord Mic—50, hand stand microphones, black or white, £4/4 each, post free.—Radio-Aid, Ltd. (Retail Dept.) 29, Market St., Watford. [0036

FOR really good results you can do no better than use Osmor coils and coilpacks, ask anyone of experience! Send 5d (stamps) today for beautifully-drawn free circuits, our new coil-data leaflet, and latest lists of matched radio components. A speedy mail order department is at your service, and remember, all Osmor lines are guaranteed. (Trade enquiries invited.) Dept. C.W.1.
OSMOR RADIO PRODUCTS, Ltd., Bridge View Works, Borough Hill, Croydon Tel. Croydon 5148-9. [0044

MALDEN TRANSFORMER SUPPLIES offers A.C. 80W fluorescent chokes, 230v with circuit, 17/6; glow starters, 2/6; 6 and 12v metal rectifiers, 2 amp, 8/6, ½ wave, 250v 300 milli-amp, 13/6, supplied to any specification; ex-Government safety heaters 230v 850W, 12/6; rotary converters, 12v or 24v d.c. input and giving 250v 60 milli-amp and 6.3v at 2.5 amp, 6/8; speaker cases, 5in. bakelite, 5/8.—200, Cambridge Rd., Kingston-on-Thames. Kin. 5501. [0056

COMPONENTS—SURPLUS AND SECONDHAND

MORRIS, 89, Tottenham Court Rd., W.1. (near Goodge St. Stn.). [0000

MIDGET radios, sensational offer! "Caddy" A.C./D.C. mains portables, ivory plastic with handle, magnificent tone and volume, guaranteed complete, ready to play, £6/19/6.
ALL-WAVE superhet midget, world-famed maker, ivory plastic; £9/19/6 guaranteed.
VALVES: VR108 (SP13C), 5/11; VT171 (DK92), VT172 (DAF91), VT175 (DF91), VT174 (DL92), 11/6; VU39 (MU12/14), 9/6; CV509 (6V6), 10/6; 500 other types available; s.a.e. for lists; trade enquiries invited; 9-6 week-days, 9-1 Saturdays. [0257

MAGSLIPS at 1/10 to 1/20 of list prices! A huge stocks, please state requirements.—K. LOGAN, Westalley, Hitchin, Herts. [0255

SEE our displayed advertisement on page 116 for surplus bargains.—Radio Exchange, Bedford. [0012

SUPREME RADIO, 746b Romford Rd., Manor Park, London, E.12. Tel. Ilf. 1260. Est. 17 years.
BARGAIN line in mains trans. by "Parmeko." Universal fixing, primary tapped 0-200-220-240v, sec. 230-0-230v, 80M/A, 6.3v 5amp and 6.3v tapped at 4v 2amp, with screen; our price 14/11 ea. plus 1/- post/packing.
SMALL vol/controls with 1/spindle and d/p switch, 1meg or ½meg, 5/- ea.
STANDARD vol/controls with 1/spindle and s/p switch, 2 meg, 100K ohms, 25K ohms, 10K ohms and 5K ohms, 3/- ea.
SPECIAL bargain line in v/controls, ½meg with 1½in spindle, 1in dia., 1/- ea.
2MEG carbon vol/controls, 1/6d ea.
SEASONAL bargain!! Manufacturer's surplus a.c. mains amplifiers, 4watts output, complete with 10in m/eng. speaker, supplied with leads and fitted with p/u sockets, all tested before dispatch, ideal for records; our price, £5/15 inc. pack/post.
VERY popular line Westinghouse type metal rec., 250v R.M.S., 65m/a, 5/6 ea.; L.T. heater trans., 0-200-250v, 6.3v at 1.5amp or 4v type at 2amp, 6/9 ea.
TELEVISION rectifiers "Sentercell" type, K5/40, 5.2K/v, 7/6 ea.; K5/45, 5.6K/v, 8/2 ea.; K5/50, 4K/v, 8/8 ea.; K5/100, 8K/v, 14/8 ea.
S.T.C. metal rectifiers, R.M.1, 5/11 ea.; R.M.2, 4/5 ea.; R.M.4, 16/- ea.
P.M. speakers, 2-3ohm v/coil, all less trans., 5in, 10/6 ea.; 6½in, 12/11 ea.; 8in, 15/11 ea.; 10in, 18/11 ea.
T.R.F. dual-wave coils for L/M wave, with circuit, 6/6 pair.
PANELS with 6 various ¼w resistors, one P/F cond. and WX6 Westector, 1/- ea.; twin balanced 80ohms feeder for television, 4d per yard.
ELECTROLYTIC cond., 8mfd 500v tag end, tub/cardboard, 2/- ea.
METAL can type electrolytic cond., 64+120mfd, 350v, 425v surge, 12/6 ea.; 16+32mfd, 350v, 4/9 ea.; 8mfd, 500v, 2/9 ea.; 16+8mfd, 450v, small type, 4/11 ea.
CARDBOARD wire-end bias cond, 50mfd,- 50v, 9d ea.; 50mfd, 12v, 9d ea.; 25mfd, 25v, 1/- ea.
MANY other bargain radio and television component lines in stock. Terms, c.w.o., no c.o.d. Send 9d extra for postage orders under £5. 2½d s.a.e. all enquiries and list. [0021

NEW surplus silver mica condensers, 1st grade: 50, 58, 60, 70, 140, 200, 1,900, 3,000, 4,000 pf., 2/6 doz., 20/- gross; 2nd grade: mixed values between 5pf and 4,000pf, our choice: gross lots, only 15/- gross; post free in U.K.; mail orders only.—I. A. Duck, 97, Belgrave Rd., Ilford, Essex. [0215

GALPINS
ELECTRICAL STORES
408 HIGH St., LEWISHAM, S.E.13

Tel. : Lee Green 0309 Nr. Lewisham Hospital

TERMS : CASH WITH ORDER. NO C.O.D. All goods sent on 7 days' approval against cash.
EARLY CLOSING DAY THURSDAY

ELECTRIC LIGHT QUARTERLY TYPE CHECK METERS, all for 200/250 volts A.C. 50 cycles; 1 phase, 5 amps load, 17/6 each, post 1/6; 10 amp 21/- each, post 1/6; 20 amps load, 35/- each, post 1/6.

RESISTANCE BOXES. Sub/Standard 200 ohms. 37/6 each.

½ H.P. A.C. MOTORS 1425 r.p.m. 110 volts only **£2.15.0** each.

ROTARY TYPE DIMMER RESISTANCES, 80 ohms., ½ to 10 amps. 15/- each, carriage 2/-

MAINS TRANSFORMERS (NEW), input 200/250 volts in steps of 10 volts, output 350/0/350 volts 180 m/amps, 4 volts 4 amps, 5 volts 3 amps, 6.3 volts 4 amps, 45/- each, post 1/6; another 350/0/350 volts 180 m/amps, 6.3 volts 6 amps, 0/4/5 volts 4 amps, 45/- each, post 1/6; another 500/0/500 volts 150 amps, 4 volts 4 amps C.T., 6.3 volts 4 amps, C.T., 5 volts 3 amps, 47/6 each, post 1/6; another 425/0/425 volts 160 m/amps, 6.3 volts 4 amps, C.T. twice 5 volts 3 amps, 47/6 each, post 1/6.

MAINS TRANSFORMERS (NEW), input 200/250 volts in steps of 10 volts, output 350/0/350 volts 300 m/amps, 6.3 volts 8 amps twice, 4 volts 4 amps, 5 volts 4 amps, 70/- each, carriage 3/6; ditto, 450/0/450 volts 250 m/amps, 6.3 volts 8 amps twice, 4 volts 4 amps, 5 volts 4 amps, 70/- each, carriage 3/6; another, input as above, output 500/0/500 volts 250 m/amps, 6.3 volts 8 amps twice, 6.3 volts 4 amps, 4 volts 4 amps, 5 volts 4 amps, 75/-, carriage 3/6. Another, wound to (electronic) specifications, 350/0/350 volts 250 m/amps, 4 volts 8 amps, 4 volts 4 amps, 6.3 volts 8 amps, 0/2/6.3 volts 2 amps, 70/- each, carriage paid; another, input as above, output 500/350/0/350/500 volts 250 m/amps, 6.3 volts 6 amps, 0/2/6.3 volts 2 amps, 0/4/5 volts 4 amps twice, 75/- each, carr. 3/6.

MAINS TRANSFORMERS (NEW), suitable for spot welding, input 200/250 volts, in steps of 10 volts, output suitably tapped for a combination of either 2/4/6/8/10 or 12 volts 50/70 amps, 95/- each, carriage 7/6.

MAINS TRANSFORMERS (NEW), 200/250 volts input, in steps of 10 volts, output, 0, 6, 12, 24 volts 6 amps, 42/6 each, post 1/6. Another as above but 10-12 amps, 55/- each, post 1/6; another, as above but 25/30 amps, 75/- each, carriage 3/6; another, input as above, output 0/18/30/34 volts 6 amps, 47/6 each, post 1/6.

EX-RADAR MAINS TRANSFORMERS, 230 volts input 50 cycles 1 phase, output 4,500/5,000 volts approx. 80 m/amps, 6.3 volts 2 amps, 4 volts 1½ amps, 2 volts 2 amps, these transformers are new, immersed in oil, can be taken out of the oil and used as television transformers giving output of 10 m/amps, overall size of transformer: separately 5½in. × 4½in. × 4in. and 3in. × 3in. × 2½in., price 75/- each, carriage paid.

EX-NAVAL ROTARY CONVERTERS, 110 volts D.C. input, output 230 volts A.C. 50 cycles, 1 phase, 250 watts capable of 50% overload, weight 100 lb., price £10 10/- each, carriage forward.

ROTARY CONVERTERS, 24-28 volts D.C. input, 1,200 volts 70 m/amps, D.C. output, 10/- each, P.P.

SWITCHBOARD METERS, 4in scale moving coil (D.C.) only 0 to 14 amps, 17/6 each, post 1/6.

MAINS TRANSFORMERS, 230 volts input, 150/0/150 volts 200 amps 6.3 volts 8 amps, 5 volts 2 amps output, 23/- each

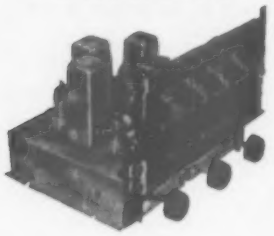
AUTO WOUND VOLTAGE CHANGER TRANSFORMERS, tapped 0/110/200/230 volts 350 watts 55/- each, post 1/6; as above, but 500 watts 70/- each, carriage 3/6; as above, 200 watts, 40/- each, post 1/6.

EX-U.S.A. W.D. ROTARY TRANSFORMERS, 12 volts D.C., input 500 volts, 50 m/amps, 275 volts 100 m/amps D.C. output. Complete with smoothing switches, fuses, etc., as new, 17/6 each, carriage 2/6, can be run on 6 volts, giving half the stated output.

MAINS TRANSFORMERS (By well-known makers). Input 100 & 230 volts, output 6 volts 1½ amps twice, price 7/6 each, post 1/-; another 200/250 input, output 25 volt 4 amps C.T. 25/- each, carriage 1/6.

RECTIFIERS, input 75 volts, output 50 volts 1 amp, 10/- each, post 2/-. Condensers 10 M.F.D. 250 volt wkg. 3/6 each; 8 M.F.D. at 1,000 v/wkg, 7/6 each; 8 M.F.D. 2,500 v/test, 10/- each.

—TUNERS—



S5 3 Wavebands. 16m.-2,000m. R.F. Pre-amplifier, variable selectivity I.F. Delayed amplified A.V.C. Very low distortion. £23/2. Tax paid

S5E 4 Wavebands, 12.5 m.-550 m. R.F. Pre-amplifier, Variable selectivity I.F. Delayed amplified A.V.C. Very low distortion. £23/2. Tax paid.

S4 The Standard high-quality Feeder Unit. Specification as S5 but without R.F. amplifier. £17/6/0. Tax paid

A modified version of all models is available for use with Leak or Acoustical Amplifiers.

Manufacturers of Ventex Products

C. T. CHAPMAN (Reproducers) LTD.

RILEY WKS., RILEY ST., CHELSEA, S.W.10

FLAxman 4577/8

Export Enquiries Invited

EX-GOVERNMENT BARGAINS!

Indicator Unit Boxes. Suitable for 13/A cathode ray tube. Complete with chassis, these have been stripped of components, but are ideal for oscilloscopes, etc. Chassis 11 x 6 x 3in. Cover 11 x 6 x 6in. which also contains a glass panel in front 3in. square. Price 3/6. Post 2/-.

Aluminium Sheets, Polished. 18 gauge, 12 x 12in. and 18 x 9in., 3/6. Post 1/-.

Aerial Coupling Units. Type G. Ref. ZA 0843. Containing large inductances, variable transmitter, type condensers, 0-1 thermo-coupled ammeter 2in., indicator light, etc., with controls brought out to front panel 15 x 11. Contained in metal box 15 x 11 x 15in. deep, with 2½in. hinge lid, complete with circuit. These are in brand new condition, apart from external scratches etc. to the case. Price 29/- Carriage 7/6.

Valves, Special Purpose, VS68, 4/6, Rectifiers: 4048A, 7/6, VU29, 10/-. Post 1/- each.

Test Meter. 3in. meter contained in square bakelite box, approx. 4½ x 4½ x 2½in. deep, with the following readings: 0-1½v.-0-3v., 0-60 mA. 0-5000 ohms. Operational details engraved on back of box. This meter can be extended to give higher range if so desired. Price 25/-. Post 2/-.

VCR97 Tubes. Special Offer. Brand new in makers' cartons. Price 25/-. Postage 2/6. We cannot repeat at this price when our present stocks are cleared.

Slow Motion Dials. 6in., 200-1 ratio, scaled 0-100, ref. 10 A/15319. Price 7/6. Post 1/3.

Time Base Units. Containing two slow motion gear driven .0005 condensers, 2 Yaxley switches, 6 way 1 pole, each connected to 6 silver mica condensers. All in metal case, part of the 62 indicator unit. Price 7/6. Postage 1/6.

Our new list, No. 9, containing over 400 ex-Government items, is now available, price 6d. inland, 1/6 Overseas Air Mail.

A. T. SALLIS

● 73 North Road, Brighton, Sussex.

Phone: Brighton 25806.

COMPONENTS—SURPLUS AND SECONDHAND

RADIO CLEARANCE, Ltd., 27, Tottenham Court Rd., London, W.1.

SPECIAL offer of electrolytic condensers, capacity, voltage, size, type of mounting, price post paid, in that order.—400, 6v. 1in×2in. lug, 2/6; 250+250, 6v, 1in×2in. lug, 2/6; 500+500, 6v, 1in×3in. lug, 2/6; 1,500, 1in×3in. clip, 3/-; 50+50, 150v, 1¼in×2in. clip, 3/3; 40+40 150v, 1¼in×2in. clip, 3/3; 40, 150v, 1in×2in. clip, 2/6; 20+20, 275v, 1in×2in. lug, 4/-; 16+32, 275v, 1in×2in. lug, 4/-; 16+16, 275v, 1in×2in. clip, 4/-; 32+32, 275v+50mf, 25v, 1in×3in. lug, 4/6; 60+100, 275v, 1½in×3in. lug, 5/6; 100, 275v, 1¾in×2in. clip, 3/9; 50 550v 1¾in×2in. clip, 3/6; 32×12, 350v, 1¾in×2in. clip, 4/9; 16+16+16, 350v, 1¾in×2in. clip, 5/3; 40+40+20, 350v, 1¾in×2in. lug, 5/3; 16, 350v, ¾in×2in. lug, 2/3; 40+40, 300v, 1in×3in. lug, 4/6; 10, 450v, ¾in×2in. lug, 2/6; 16, 450v, ¾in×2in. 3/3; 20, 450v, 1in×2in. lug, 3/3; 32, 450v 1¼in×2in. clip, 4/-; 24+12, 450v, 1¼in×2in. clip, 3/3; 16+16, 450, 1¼in×2in. clip, 5/6; 32+32, 450v, 1½in×3in. clip, 6/-; 50+50, 450v+20mf 25v 1¾in×3in. lug, 6/-; 16+15, 450v+20mf 25v 1¾in×3in. lug, 5/3; 200mf, 6v, ⅜in×1½in. clip, 2/3; 100mf, 12v, ⅜in×1¼in. wire, 1/9; 1,000mf, 6v, ⅜in×2in. clip, 2/6; 8mf, 450v, 1in×2in. clip, 2/3; 50mf, 12v, ¾in×1¼in. wire, 1/9; 150mf 25v, ¾in×1¼in. clip, 2/-; 250mf, 12v, ¾in×1¼in. wire, 2/6; 350mf, 25v 1in×2¼in. clip, 2/9; 16+16mf, 450v, 1¼in×2in. clip, 4/3; 40+40mf, 275v, 1¾in×2in. clip, 5/9; 16+32mf, 450/525v, 1¾×2in. clip, 5/6; 24+24+16mf, 350/425v, 1¾×2in. clip, 4/9; 60+200mf, 275/350v, 1¾×4¼in. clip, 6/6; 24+16+8mf, 450v, 1¾in×2in. clip, 6/-; 1,000mf, 12v, 1in×2¼in. clip, 5/-; 4mf, 150v, ⅝in×1¾in. 1/-; 50+100mf, 350v, 1⅝in×4½in. clip, 6/6; 8mf, 750v, 1⅝in×4½in. clip, 4/-; 500mf, 12v, 1⅛in×2¾in. clip, 2/9; 8mf, 350v, ⅜in×2in. 2/-; 6,000mf, 6v, 1¾in ×5¼in. clip, 4/-; all are all cans, some with cardboard sleeves, all voltages are WKO, all new stock, some limited quantities. Trade supplied most types.

TELEVISION! Set of 3 components, comprising line output trans., with E.H.T. winding to give 7kV using EY51 (fewer windings for EY51 also included), and fitted with width control scanning coils, low impedance line and frame, focus coil (res. 10,000Ω, current approx. 20 mA); the set of 3 for 42/-, plus 1/6 post, diagram of line trans. supplied.

PERSONAL receivers, 3 valve T.R.F. using 1T4s, contained in handsome bakelite case with lift-up lid, size 7×6¼×5in with lid closed, plastic carrying handle, fram. AE in lid, these receivers cover the medium waveband and operate from self-contained dry batts., standard types, W1435 and U2, output to a pair of lightweight 'phones (H.R.) controls, SM tuning and reaction, opening lid switches on, supplied brand new, with valves, batteries, 'phones, an ideal set for invalids, hosp. patients, etc., these receivers are not Govt. surplus and are offered ready to play; carr. paid, £4/10.

CHASSIS steel, 5¼×5¼×1¼in drilled 3 button base holes, 1/9, 5×9×1¼ drilled 5 button base holes, 2/3; all 14¼×10×2¾ drilled 10-B8A, 5 int. octal, 4/-. T.V. mains primary 0-10-200-240v 50c/s, secs 300-0-300 80ma, 4v 2a, 6.3v, 2.5v 15/6; superhet coils 1½×1¾ formers M. wave H.F. AE. Osc. L. wave H.F., AE. Osc. 1/9 per coil; I.F. trans. 465Kcs 1½×1¾×4in. iron cored, 8/- pair; meters 2in square bakelite case, 0/5ma, 6/6; 0-500v d.c. with series res. 7/6; Rotary power units, type 104, p.m. rotary mounted on chassis with supp. input 12v d.c. 600ma 250v 50ma 6.5v, 2.5a, 7/6, type 87 24v input, outputs as 104, 7/- post paid; plugs and sockets, bakelite with keyway, 5, 7, 1/6 pair; focus coils, low res., 2000Ω, standard TV, 8/6, can be had as alternative with kit if required, 6½in loudspeakers p.m., less trans., boxed, 13/6 post paid.

SMALL size, 4P 3w switches, 1in spindle, 2/9, standard Yaxley-type switches, 2¼in spindle, 4P 5w, 2/9; 2¼in spindle, small size, 465Kcs I.F.s iron cored, 2¼in×1in×1¼in, 9/- pair; 6½in P.M. speakers, with transformer (5,000/3Ω), 16/6 post paid; small size O.P. trans., 10,000/3Ω, 2/11.

VITREOUS res., 5k 20w, ⅝in×3in. with clips, 1/6; carbon V.C. 10k small L/S, 3in spindle, 1/9.

E.H.T. trans, pri. 230v, 50c sec, 4,000v, 1ma, 2v, 2a, with U22 valve holder mounted, gives 5,500v, smoothed; 27/6, post paid.

RADIO CLEARANCE, Ltd., 27, Tottenham Court Rd., London, W.1. Tel. Museum 9188. [0015

WODEN Williamson OP trans 1.7 ohms, new, list £6/10, accept £4/5.—Lee, "Doonside," Holland Rd., Bilston, Staffs. [9217

MIKE trans. 10:1 9d; 25k Potms., 6d; 0.005 ceramic, 2d; .001 mica, 4d; l.r. phones, 1/-; free lists: Annakin, 25, Ashfield Place, Otley, Yorks. [9327

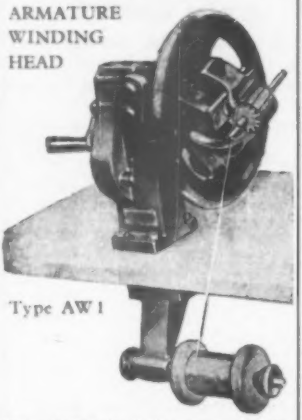
SELENIUM rectifiers, 18mm and 25mm. single or qty., many types, state requirements.—Champion Products, 43, Uplands Way, London, N.21. Lab. 4457. [0102

MAOSLIP transmitters 3in. No. 5, A.P.1086L. A large quantity, brand new, in tins; 45/- ea. post free.—P. B. Crawshay, 166, Pixmore Way, Letchworth, Herts. [0241

NEW boxed U.S.A. 24-volt d.c./a.c. fan blowers, 10/6, new Amphenol 913A photo tube, 11 pin valveholders, 1/-; new U.S.A. small chrome-plated 24-volt motors, ¼in shafts, 8/6; new U.S.A. well-known make 10mfd, 600-volt paper condensers with clips, 7/6; new wire-wound 6-watt potentiometers 20K, full 1¼in shaft, 2/9; new wire-wound 3-watt pots, 10k 1in shafts, 1/6; ditto 25k, 1/6; new U.S.A. 6V6 copper screened output transformers, 4/6.—Jack Porter, Ltd., 50-51 College St., Worcester. [9284

KOLECTRIC

ARMATURE WINDING HEAD



Type AW1

This winding head has been primarily designed for use with the "Kolectric" Model H.1 hand coil winding machine, but it can be used on other makes of machines and can also be motorised if desired.

Please write for illustrated leaflets

KOLECTRIC LTD

73 UXBRIDGE RD., EALING, LONDON, W.5

Telephone: EALing 9096

THE

BRITISH NATIONAL RADIO SCHOOL

ESTD. 1940

NOW IN OUR THIRTEENTH YEAR AND STILL

NO B.N.R.S. STUDENT HAS EVER FAILED

to pass his examination(s) after completing our appropriate study course

XMAS PRESENT AND NEW YEAR RESOLUTION

A B.N.R.S. STUDY COURSE

A.M.Brit.I.R.E. and CITY and GUILDS Radio and Telecommunications Exams, etc., etc.

Please mention this advert. and send for free booklet to:—

STUDIES DIRECTOR

BRITISH NATIONAL RADIO SCHOOL

66, ADDISCOMBE ROAD, CROYDON

Phone: Addiscombe 3341

Remember! XMAS is HOLLEY TIME

WE PROUDLY PRESENT An Outstanding Advance in Speaker Design.
DAILY DEMONSTRATIONS or DETAILS on application.

Other items in stock :

VOIGT Corner Speaker	£87	0	0
GOODMANS Axiom 150	£18	5	0
GOODMANS Axiom 150 Mk. II	£15	6	10
TANNOY Dual L/S	£37	10	0
GOODMANS Audiom 60	£8	5	0
WHARFEDALE W 12 c/s	£9	15	0
WHARFEDALE W 10 C/SB	£9	5	0
WHARFEDALE Super 5 and 8	£7	4	0
WHARFEDALE Gol. SFB	£18	10	0
LEAK TI2 Amplifier	£23	7	0
LEAK Varislope Preamp.	£12	12	0
LEAK Pickup Ruby	£11	17	6
SOUND SALES A-Z Amp.	£22	10	0
QUAD Amplifier and T/C	£35	0	0
SOUND SALES Tonemaster Amplifier and T/C Unit	£25	0	0
ROGERS Minor Amplifier	£11	0	0
ROGERS Baby Amplifier	£18	0	0
DECCA Amplifier	£25	0	0
GARRARD 201B Motors	£23	10	0
GARRARD 72a Motors	£12	12	0
GARRARD 75A, 3 speed	£16	16	0
PLESSEY 3-speed Auto	£21	0	0
CONNOISSEUR, 3 speed	£23	13	0
B.S.R. GU4	£9	19	11
COLLARO RCS11	£11	11	0
CONNOISSEUR 2 speed	£22	15	0
WEARITE Tape Decks	£35	0	0
SOUND SALES Projection TELEVISION	£145	0	0
CONCRETE Corner Panels	£3	15	0
LOWTHER DT/L Tuners	£37	17	10
DECCA XMS Pick-ups	£7	0	0
RADIOGRAM Cabinets ..... from	£12	12	0
ARMSTRONG Chassis ..... from	£25	12	4
REFLECTOGRAPH Tape Recorder	£90	0	0

Demonstrations from 9.30 a.m.-1 p.m., 2-6 p.m. 1 p.m. Thursday.

"The Firm with After Sales Service"

HOLLEY'S RADIO STORES

285, CAMBERWELL ROAD, LONDON, S.E.5

Telephone : RODney 4988

COMPONENTS—SURPLUS AND SECONDHAND

G.E.C. 7-watt VHF mobile transmitter/receivers, complete with 12v rotary power pack 80.9, 81.1, 81.3 mc/s, new, £37/10 each.

U.H.F. 110-250v A.C. repulsion motors, 1,000/1,450 r.p.m., by Century and Neco, £5 each.

DENCO D.C.R.19 receiver, £30; G.E.C. single channel V.H.F. transmitter/receiver, Cat. No. B.R.T.600, special offer semi-shrouded mains trans. 250-0-250 60ma, 5v, 2amp, 6.3v, 4amp, 12/3 each; communication receivers in stock, Hammerlung Super Pro, H.R.O. Seniors, C.R.100, A.R.88D., A.R.88L.F., etc., all in perfect order; R.1155 receivers in new condition, your enquiries are invited for rotary convertors and electric motors, most sizes and type available from stock; special clearance of F.H.P. electric motors, 35/-, 110v 250v a.c.

UNIVERSAL a.c./d.c. motors, suitable for sewing machines, 40/- each; 12v-15v a.c./d.c. motors with extended spindle, suitable for models, etc., 9/3; 20 watt P.A. rack mounting amplifier, new and complete, with heavy duty a.c. power pack, 200/250v, PX25 P.P. output, £5/10, less valves; new moving coil microphones, hand type, heavy duty and complete with 12yd screened cable, £3/15; 20ft telescopic tubular T.V. mast, 18/6 each; large selection of test equipment; multi-range meters, valve testers, signal generators, oscilloscopes, bridge meggers and meggers, etc., all at reasonable prices, hand bearing prismatic compasses, perfect, 45/- each; very large stocks of transmitting valves, Klystron, of all types, send us your requirements, special offer of new, not ex-W.D., mains transformer, semi-shrouded 200/250v tapped primary, 250-0-250, 100ma, 5v 3amp, 6v 4amp, 21/6 each; large stocks of L.T. transformers, special sizes and ratings wound to specification; auto-record changers in stock from £13/2/6 to £18/10; switchboard mounting volt meters, ammeters, various ranges a.c. and d.c. available at cheap prices to clear; large stocks of enamelled wire, 18 and 20 s.w.g., D.S.O. Special offer, H.R.O. coils, 48-96 m/s and 180-450 k/s, 45/- each, quantity of nut and radial chrome wire available; type 74 indicator units, complete with tube, as new, £6 each; Hallicrafter Super Skyrider 2X28 in stock; Eversbed bridge megger, 500v 1½kw e.d.c. rotary converter, 220 d.c./250 a.c., complete with Igranic starter, £28; large selection of American Pyranch high-voltage working condensers; 5m/a meter rectifiers, 6/3 ea.

HAMMERLUND B.C. 779B, perfect order, rack mounting, £42/10; Q-Max Q-5/10 receiver, new £38; prices do not include postage.

D.S.T. 100 receivers, perfect, £26; Celestion 12in P.M. speakers, heavy magnets, £5/10.

SERVICE RADIO SPARES, 4, Lisle St., W.C.2. Gerrard 1754. {0188

NEW items, primary, 205-225-245v, sec. 500-0-500v at 50ma, 6.3v tapped, 4v 2.2amp and 6.3v at 1 amp, boxed, 15/-, post 1/6, resistors, standard values, 1/- and ½w, 5/- doz. assorted, your choice; 25 ohm w.w., 5w adj. tap, 6/- doz.

ELECTROLYTICS, 8mf 500v, 2/3; 8mf 200v, 1/-; 16mf 350v, 2/-, 16mf 500v, 2/6; 32mf 450v, 2/6; 25mf 25v, 1/4; 16-16mf 500v, can, 5/-; 32mf-8mf-8mf 35v, can, 4/-; speakers, 5in 9/-, 6½in 12/-, 10in 15/-; ceramics disc, 20, 25, 30pf 1/6 dozen; 50pf, 2/6 doz.

TUBULAR condensers, 1mf 350vw, 6/6 doz; 1,000 vw, .01mf, 7/- doz.; .001mf, 5/- doz; also vibrators, valves, key-switches, radio and T.V. cabinets, low prices; send us list of your wants; money-back guarantee.—Rous Electric, Ltd., Gladstone Place, Newton Abbot, Devon. {0214

SURPLUS to requirements; new goods in perfect condition: 16.750 8BA×¾in hex. steel screws, 80,000 steel 6BA bolts, 20lb 44 s.w.g. S.S. nichrome wire, 54lb 34 s.w.g. S.S. enamel wire, 40lb 37½ s.w.g. S.S.C. resistance wire, 250lb 40s s.w.g. S.S.C. enamel wire, 500 6BA tags, 200 7BA tags, 712 7BA tags S.S., 150 4BA tags.

OFFERS to clear part or whole to—J. Oldham, 516, Holloway Rd., N.7. {9247

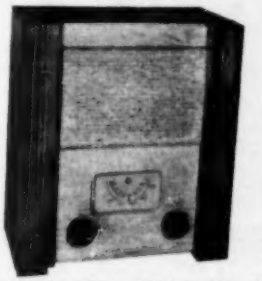
G. A. RYALL, "Utopia," Mayfield Road, Herne Bay, Kent, offers brand new post-free bargains; switches; 2B.SP, 6-way, no stop, switch is drilled for this, 1/4; smaller type switch, 3B, 1P, 6-way, total five poles only, 2/3; also 2B, 3P, 5-way with coloured leads, 1/9; and one only with soldered tags, 2B, 6-way, total of five poles, including one double bank, 1/4; Toggles Bakelite, 250v a.c., close either of two poles, 1/3; and 2P, DT, change over 1/9; all single hole fixing; and Bakelite panel switch marked On/Off, break 10amps, four-hole fixing, 2/6; voltmeters, 0-5Kv, separate series resistance, F.S.D. 5ma 2in square front, last few, 8/9 each and 0-30ma 2½in (3¼in overall), 6/9, or best make, 8/9; signal lamps, panel mtg, red or green, with 12-24v bulb brass case and bakelite top with protection, 4/6 each; triple light cable over 3yds length, 1/4, plastic; screened twin, 3 yds, in two lengths, 1/4; triple plugs and jacks, 1/4 set; Manshridge condensers, fixing feet, heavy duty terminals, 250v M.I., 5×3 4/-; ditto oil filled 11×7, 8/9; extra heavy terminals at side; first-class Bakelite fuse boxes, four-way, with two spare fuses, 5 amp cartridge, 5/9; small single 20 amp or 10amp, with spare, 2/6; set fuse panels with over thirty 1¼, ¾, 1/2 watt resistors, 5/6; and high grade panel with fixing bolts, 0.1mf and 4,700v resistor and two ¼w, 2 1/3; 1mf Mansbridge, upright or inverted, 2 1/3; radio mains suppressor units, four-division, fixing feet terminals, etc., 7/9; headphone sets, high resistance, complete with padded headbands, sponge rubbers on ear caps, and good class microphone, all wired into four cleft plug as illustrated in R.A.F. adverts, as new, 10/9 set, meters sealed 0-500v F.S.D. 5ma and 0-5ma, both types slightly defective and suitable for low current continuity meters, no series res., with r/m. square front bakelite, 5/9 each. {0205

LONDON CENTRAL RADIO STORES

HIGH SPEED TWIN COIL ELECTRO MAGNETIC COUNTERS

Excellent quality in new condition. With 50 ohm and 1,500 ohm coils, 10 pulses per second approx. Counts to 9,999 and automatically returns to zero. 23-50-v. D.C. Size 3½ × 1 × 1in. **22/6.** Post and pkg. 9d.

4-VALVE (Used) SUPERHET UTILITY RECEIVERS
—Medium wave band only.



Four valves, P.M. Speaker, complete in pine wood cabinet size 13½ × 12 × 6in. In good condition. A.C. mains 200/250 volts. Price **£4.10.0** Carr. and pkg. 5/-.

WALKIE-TALKIE (Transmitter and Receiver) Type 38 Mk. II. Complete less batteries. Range 7-6 Miles. Limited number. Requires 2 v. L.T., 120-150 v. H.T. Complete with 5 valves, one pair throat mikes, pair headphones and aerial, also battery junction box. In metal case. Free wiring diagram. **£3.15.0.** Carr. and pkg. 2/6.

WANTED TEST EQUIPMENT • COMMUNICATIONS RECEIVERS • TELEVISION RECEIVERS Etc.

FLUXMETERS Model WT0003. Calibrated in three ranges, 300-1,000, 1,000-2,000, and 2,000-4,000 Gauss. Direct reading. Complete with polarity indicator and probe for minimum gap of 1in. Brand new in portable wood case with carrying handle. 12 × 8½ × 9½in. Less battery. **£4.5.0.** Carr. and pkg. 5/-.

Cossor **DOUBLE BEAM OSCILLOSCOPE** No. 339A. **£37/10/0** each. Carr., etc., 20/-.

UNISELECTOR SWITCHES. Full wipers 2-bank **10/6**, 4-bank **17/6**. Half wipers 6-bank **27/6**, 9-bank **42/6**. Have various applications, including automatic tuning circuit selection, etc. Operates on 25-50 v.

VIBRATORS, 6-volt, Type R76C. 7-pin self-rectifying. Output 200-v at 60mA. Made by Electronic Laboratories Inc. **7/6. Mallory, Type 6012C.** 12-volt, 4-pin American base, **7/6.**

RIFE ACCUMULATORS. 1.5-v, about 10 amps, size 6½ × 1½ × 1½in. Post and pkg. 9d. **6/6.** Also Ex-Navy type, slightly shaped, 1.5-v, about 20 amps, size 8 × 4 × 1in. All guaranteed, post 1/-. **15/-.**

PHOTO ELECTRIC CELLS. Type CV142. Small infra red image glass converter, tube, 50-160v. Suitable for all purposes. N.B.—We cannot enter into correspondence regarding these cells. **14/6.**

ELECTRO MAGNETIC COUNTERS. Ex-G.P.O., every one perfect, electro-magnetic, 500 ohm coil, counting to 9,999, operated from 25-v.—Silvey, D.C., 4½in. long × 1½ × 1in., many industrial and domestic applications. **15/-. EQUAL TO NEW.** Post and pkg. 9d.

TELEPHONE 4-VALVE BATTERY PORTABLE (Fixed Ranges, Type TA491b. Includes three XH and one XP Hivac midget valves. Can be adapted for Deaf Aid or Midget Receiver, but we do not supply information on this point. Batteries required, 3 v. L.T., 97 v. H.T., in metal case, size 5½ × 7 × 3½in. Weight 4 lb., less batteries. **45/-.** Carr. and pkg. 2/6.

PHOSPHOR BRONZE STRANDED AERIAL. Ex-Admiralty. 100ft coils, **6/6**, p. & p. 1/-.

DIRECTY CELLS. Suitable for sets, electric bells, lamps, etc. Size 3in. × 2in. × 2in., 1.5 volts **2/10** each.

N.B.—We do not issue lists or catalogues. Carriage Charges relate to British Isles only.

23 LISLE ST. (GERrard 2969) LONDON, W.C.2

Closed Thursday, 1 p.m. Open all day Saturday

Surplus BARGAINS

MANUFACTURER'S & BANKRUPT STOCKS

LIMITED SUPPLIES ONLY

We can offer for immediate delivery

LARGE STOCKS of RESISTORS

ALL VALUES: ½, ⅓, ¼, 1, 2, and 3 WATT.

Electrolytic Condensers—All Types

ANTI-INTERFERENCE AERIALS

SPECIAL QUOTATIONS FOR QUANTITIES

Low and High Resistance Headphones

Reflex Fuseholders: Plugs and Sockets: Bakelite Accumulators: Dinghy Transmitter Sets: Output and Mains Transformers: Valve Holders: Yaxley Type Switches: Speakers, all types: Meters: Chokes: Coaxial Cable: Magnifying Lens: Rubber Masks, etc. etc. Your enquiries are invited.

WHOLESALE AND EXPORT ONLY

For further bargains call at our Counter or write for NEW bulletin.

RADIO MERCHANDISE COMPANY LIMITED

65, Farringdon Road, London, E.C.1

Telephone: HOLborn 6377 Cables: Radiex, Wesdo

"AUTOMAT" HOME CHARGERS, CHARGER KITS, SELENIUM RECTIFIERS

New Goods with Full Guarantee

"AUTOMAT" HEAVY DUTY HOME CHARGER, virtually unbreakable, for your car battery or radio cells. Selenium rectification, 12 months genuine guarantee, fine workmanship and appearance, dampproof, 8/d. model 6 v. or 12 v., 2 amp. output, 59/6, post 3/-; or 3 amp. model 12 v. only, 72/-.

ELIMINATOR KIT. Transformer, selenium, H.T. and L.T. rectifiers, 12 plus 12 mfds., cond. for 120 v. 20/20 mA., eliminator with ½ amp. trickle charge, 35/-; with handsome steel case, 45/-, post 1/3.

FOOLPROOF CHARGER KITS. Really trouble free and reliable, with full instruction sheet and circuit. Standard kit, 12 v. 3 amp. rect., 45 watt trans., ballast/indicator bulb for 2 v., 6 v., 12 v. charger, no rheostat or ammeter needed, 38/6, post 1/6, or with handsome steel case, 52/-, post 2/-. Ditto but 7, 6, 12 v. 3 amp. 46/-; or with case, 58/6, post 2/-; also 12 v. 4 amp. rect., 70 watt trans., ballast bulb for 6 v./12 v., 55/-. Ditto 5 amp., 75/-. Minor kit as above for 6 v./12 v. 1 amp., 27/6, post 1/4; case 11/- extra.

SELENIUM RECTIFIERS, H.T. and L.T., new stock, not surplus. 2 v./6 v. ½ amp. h. wave 4/10; 12 v. 1 a. h. wave, 6/-, post 6d.; full wave 6 v. 2 amp., 9/-; 12 v. 2.5 amp. 15/6; 12/15 v. 3 a. to 2.4 a., 16/6, all post 8d.; 6 v. 4 amp., 16/6; 24 v. 3 amp., 35/-; 12 v. 5 amp., 27/6; 24 v. 5 amp., 54/-; large finned type, 12 v. 6 amp., 33/-, all post 1/4. H.T. rects., small space selenium, all new, 250 v. 60 mA., 7/6, post 3d.; 350 v. 120 mA. bridge, 14/6, post 4d.; 550 v. 200 mA. bridge, 24/-; ditto 300 mA., 32/-. Elim. rect. 135 v. 30 mA., 6/6, post 3d.

RENEWHAT, battery desulphator and conditioner, our size, 3/-.

CHAMPION PRODUCTS

43 Uplands Way, LONDON, N.21. Phone LAB 0487

COMPONENTS—SURPLUS AND SECONDHAND

SOUTHERN RADIO SUPPLY Ltd., 11, Little Newport Street, London, W.C.2. See our displayed advertisement, page 124. [0016

RADIO UNLIMITED, Elm Rd., London, E.17. A offer stnd. 465 kcs I.F. trans. 9/9 pair; P.M. spkrs., pre-tax, 5in 2-3 ohms 12/6, 8in 15/6, o/trans stnd. pent. 4/3, h/duty 5/9, p/pull tapped 7/9; v/cntrls., range 10K to 2 meg., 4-spin. 3/-; 8P/sw 4/3; special 47k, 100k, 500k DP/sw 4/6; crystal diodes 2/9, 0025 S.dilec 5/3, mns. drprs. 0.2 and 0.3 4/6; valve component list, s.a.e. [0062

LOOK!—Plan position indicators containing 17 valves—2 VT60A (807), KTZ41, 2 DDL4, MM4, VR78, 7 VR65A, HVR2, 2 UU4, large 250 1/50 power pack giving 500v-0-500v (twice), 6.3v 2/0.3v, 4v (twice), 4,000v EHT (approx.), M type motor with reduction gearing (worm and spur), scanning coils with slip-rings, large quantity of other parts, including 22 toroidal, WW, and other pots, 24 Manebridge condensers (1-10mfd 450v and others up to 5,000v), switches, 8 knobs (fluted), 14 jacks, fuses micro-switch, dial light, 70 vitreous and other resistances and condensers, etc.; the whole mounted in handsome heavy gauge steel cabinet, 20½in×27in×60in high, finished in black, with hinged doors and plated handles; price (unused), £8/15 each carr. paid (cabinet alone worth more).—K. M. Logan, Westally, Hitchin, Herts. [0258

NOTICES

BRITISH SOUND RECORDING ASSOCIATION.

MEMBERSHIP is essential to all actively engaged or interested in really high quality sound recording and reproduction and is world wide. Fees are most reasonable and benefits considerable. First-class programmes of lectures and demonstrations have been arranged for the 1952-53 season and the new Northern Centre meeting in Manchester, is making very good progress. The Portsmouth Centre is now well established. Information may be obtained from the Membership Secretary, H. King, 49, Mount View Rd., North Chingford, London, E.4, England. [0119

CABINETS

WALNUT radiogram cabinets; details.—Cabinetware, la, Heyes St., Blackburn. [0091

WALNUT radiogram cabinets; stamp details.—E. Wisker, 501, Hale End Rd., Higham Park, E.4. [9009

WALNUT radiogram and television cabinets, soundly constructed, stamp details.—R. Shaw, 69, Fairlop Rd., Leytonstone, E.11. [8897

WANTED, EXCHANGE, ETC.

WANTED.

BC610 Hallicrafters, also spares; RCA ET 4336 series with spares; BC348 receivers, also TC86, TC812 and components.

McELROY ADAMS MFG. GROUP, Ltd., 46, Greyhound Rd., W.6. Tel. Fulham 1136-9. [0197

WANTED, receivers A.P.R.4, also T.N. 16, 17, 18, 19, etc., and any radio test gear.

LESLIE DIXON & Co., 214, Queenstown Rd., Battersea, S.W.8. Macaulay 2159. [0176

WANTED, Wharfedale W15/CS loudspeaker unit in perfect condition.—Box 5496. [9299

WANTED, 75in metal horns only.—Details and price to Radiovox, Oxford Place, Leeds. [9296

VALVES, type 813 (R.C.A.), urgently required by manufacturing concern.—Box 1642. [8892

WANTED, quantity valves, type 805 and 866A, 805 must be either R.C.A. or G.E. manufacture.—Box 8785. [8765

WANTED, RCA 4351 transmitters.—P.C.A. Radio, Cambridge Grove, Hammersmith, W.6. Tel. Riverside 5279. [0095

WANTED, laboratory test equipment, including standard signal generator, watt meter, oscilloscope, bridges, recorders; send price and details to:

HATFIELD INSTRUMENTS, 175, Uxbridge Rd., Hanwell, W.7. Tel. Ealing 0779. [0037

WANTED set manufacturers' or ex-Government radio equipment, large or small quantities of valves, electrolytics, speakers, meters, also components.

LOWE BROS., 199, Mile End Rd., London, E.1. Ste. 2579. [6554

SCR 536 Handie Talkie (also known as BC 611 transmitter receiver) spare parts wanted, including cases, top and bottom lids, microphones, earphones, crystals and coils.—Details to Box 3520. [1323

WANTED, BC-610 Hallicrafters, RCA ET-4336 transmitters, SX-28 AR-88, S27 HRP receiver and spare parts for above; best prices.—Write Box 864, c/o Spiers Service, 21, Soho Square, London, W.1. [0081

ALTHAM RADIO Co. pay highest prices in the trade for all American equipment, including test sets, transmitters, receivers, teleprinting gear, etc.—Tel. transfer charge, Manchester, Deansgate 5387. [0228

WE purchase all types of domestic or ex-Government radio receivers and equipment; send full details or call and collect cash; large or small quantities.—Walton's Wireless Stores, 48, Stafford St., Wolverhampton. [0146

The Radar Kilovolter

Range 3-30 Kv

Size 6¼" × 1¼

RETAIL PRICE £3-17-6

for measurement of

Line-flyback, R.F. and Pulse E.H.T. Systems

The Radar Kilovolter has been introduced to meet the needs of the service engineer for an inexpensive instrument to measure the E.H.T. voltage applied to the anode of television picture tubes including the higher voltages used with projection type tubes.

The Kilovolter consists essentially of a calibrated spark gap and no load is presented at the correct setting.

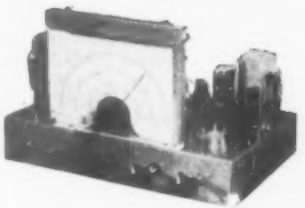
Safe, reliable and fully guaranteed.

Order now from your usual supplier or direct from:—

WAVEFORMS LIMITED Radar Works, Truro Road, London, N.22

Telephone: Bowes Park 6641-2-3.

FIDELIA *De luxe*



Seven reasons why this, our 5-valve chassis, is our most popular model.

- 7 watt push-pull triode output stage
- Electronic tone control with separate bass and treble controls.
- Infinite impedance detector.
- 8-20 k.c. variable selectivity.
- 20-20,000 cycle audio response, suitable for both 78 and L.P. recordings.
- Hand built throughout.
- Price £25/5/-.

Other models in our range are :—

Fidelia Minor 6 valve model, £17/10/-

Fidelia Standard 7 valve model, £21/15/-

Fidelia Plus 8 valve model, £24/5/-

Fidelia Major 10 valve model, £28/15/-.

Technical data sheets free on request

ELECTRO-Acoustic DEVELOPMENTS

2 Amhurst Road, Tolcombe Chfs, Dartford.

LARGE SCREEN TELEVISION

Wide Angle Scanning can only be accomplished by using HIGH EFFICIENCY COMPONENTS and "ALLEN" can supply the WHOLE range necessary for this NEW TECHNIQUE.

THE LINE/SCAN TRANSFORMER

Capable of fully scanning any C.R. Tube from 9" up to 17" (Double D) Scan at 16 K.V

THE DEFLECTOR COILS designed for a 70° Scan with minimum deflection defocussing.

FOCUS COILS—FRAME TRANSFORMERS—LINEARITY & WIDTH CONTROLS are all available to complete the range.

All these components are specified for the "TELEKING"

For Circuit diagram of Line and Time Base for use with 12" to 17" C.R.T.s, send 9d. and S.A.E.

ALLEN

COMPONENTS LTD

(Specialists in the Manufacture of L.T. Transformers.)

"CROWN WORKS," 197, LOWER RICHMOND ROAD, RICHMOND, SURREY

'Phone: Prospect 9013

WANTED, EXCHANGE, ETC.

WANTED, HRO coils, Bias, etc., A.R.88, BC348s, 82Fs, etc.—Details to R.T. & I. Service, 254, Grove Green Rd., London, E.11. Ley. 4986. [0165

WANTED, RCA speech amplifiers, type MI-11230 J or K and aerial tuning units BC 939 A Hallicrafters speech amplifiers BC 614.—Offers stating quantity and price to PCA Radio, The Arches, Cambridge Grove, W.6. [0080

WANTED, AN/APR-4 receiver, any units; any other good quality U.S. surplus radio and radar tubes, test sets; laboratory equipments etc.; give condition and price in first letter.—Engineering Associates, 434, Patterson Rd., Dayton, 9, Ohio, U.S.A. [0234

WANTED, good quality communication rss., domestic radios, test equipment, etc.; top prices paid; established since 1937.—Miller's Radio, 38a, Newport Court, 1 min. from Leicester Sq. Tube. Tel. Ger. 4634. Call, write or send. Hours of business 10-6 p.m. Open all day Saturday. [9147

WANTED; we will pay 10% more for the following American equipment; test sets with TS prefix, BC221, APR4 receivers, APR4 tuning units, BC342, BC312, power units No. 15 and PE86, teleprinter equipment.—Tel. immediately, transfer charge, Manchester, Deansgate 5347, Altham Radio Co. [0227

WANTED, new surplus valves of all descriptions, large or small quantities, types 723A/B, 805, 807, 813, 833, 1000s, 2K0th, 2C40, 2C45, test instruments, receivers, transmitters, BC610, etc., best prices paid.—Write Pype-Hayes Radio, 606, Kingsbury Rd., Birmingham, 24. (Phone: Erdington 4942.) [8611

URGENTLY wanted.—VHF test equipment TS47AP, TR176D, TS34, TS148/UP, TSX-45E, BC221s and any other types; valves, klystrons, magnetrons 723/AB, receivers, APR4 and TN-16-17-18 tuning units, RCA, AR88s, 82Fs, EX28s, 827CA and any late types; microwave equipment or spares; highest prices given; please write, call or telephone Gerrard 6410; prompt attention assured.—Universal Electronics, 27, Lisle St., Leicester Square, London, W.C.2. [0219

REPAIRS AND SERVICE

ARMATURE Re-winding Service to the Trade.

VACUUMS, drills, grinders, hood dryers, dental motors, vacuum cleaner armatures replaced from stock. 24-hour service; every job guaranteed. REGAM ELECTRIC, 95, Park Lane, Leeds. [0221

MAINS transformers rewound, new transformers to any specification.
MOTOR rewinds and complete overhauls; first-class workmanship, fully guaranteed.
F.M. ELECTRIC Co., Ltd., Potters Bldgs., Warser Gate, Nottingham. Est. 1917. Tel. 3655. [0115

REPAIRS.—E.H.T. mains and O.P. transformers, field coils and chokes; also armatures and motors; new transformers designed to any specification; all work fully guaranteed.
WILLESDEN TRANSFORMER Co., Ltd., Rear of 21, Church Lane, Church Rd., N.W.10. Tel. Willesden 7091. [0076

MAINS transformers rewound or constructed to any specification; prompt delivery.—Bede Transformer Co., Ltd., Bellesway, Bede Trading Estate, Jarrow. [5196

ELECTRICAL test instruments repaired and re-standardised all types British or American, ammeters, voltmeters, ohmmeters, DC/AC multi-range meters, etc. Meters converted to specification.
THE ELECTRICAL INSTRUMENT REPAIR SERVICE, 329, Kilburn Lane, London, W.9. Tel. Lad. 4168. [9175

REWINDS and conversions to mains and output trans., clock coils, fields pick-ups, etc.; from 4/6; pp equipment a speciality; all work guaranteed.—N. L. Rewinds, 82, Blackbird Hill, N.W.9. Tel. Wardsworth 7791. [0235

ALL types of transformers, chokes and field coils for radio and television, etc.; promptly and efficiently rewound or manufactured to any specification.—Ladbroke Re-wind Service, Ltd., 54, Hainham Rd., Kensal Rise, N.W.10. [0222

BERNARD J. BROWN announces that he has joined the management of Leevers-Rich Maintenance, Ltd., where extensive facilities are available for servicing sound recording equipment, including magnetic recorders.—80/82, Wardour St., W.1. Gerrard 4161. [0217

24-HOUR service, 6 months' guarantee, any transformer; rewind, mains outputs and i.f.s., etc.; all types of new trans., etc., supplied to specification; business heading or service card for trade prices.—Majestic Winding Co., 180, Windham Rd., Bournemouth. [6520

MISCELLANEOUS

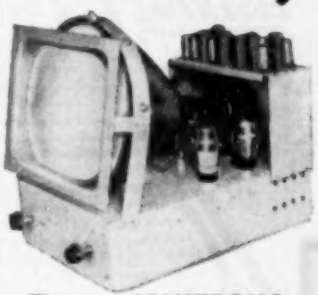
A VERY counting scale for sale, 500h capacity, unused 1951 model.—Box 3567. [9276

NEW 19in Post Office racks, 5ft 6in high, 2 channel sides, drilled every inch, wide feet, £3/10 each.—Harris, The Hyon, Bournemouth.

PRESSURE units, as new, Grampian 8P1 £5/5, Vitavox 20 watt £7/5, Reslo & Racon £3/15, 1952 J.A.P. petrol gen. set, self-starting 250v A.C. 150 watts 90 c.p.s., new, £20.—Ross, 58, St. Johns Rd., Manchester, 16. [9328

FOR sale.—One second-hand Marconi telegraph/telephone equipment type TG6 501A/CB100/2 complete with six sets additional frequency components.—Detail and inspection apply Colonial Development Corporation, 33, Dover St., W.1. [9200

Armstrong

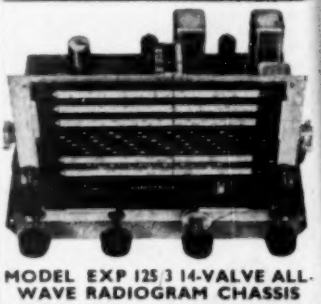


The new ARMSTRONG TELEVISION CHASSIS, Model TV.15, incorporating a 12" C.R.T., is now available for distribution, complete with 10" Loudspeaker.

PRICE: £55.13.0 TAX PAID

Aerial erection and servicing by skilled Engineers, in any part of England and Wales, is provided.
A fully comprehensive MAINTENANCE and INSURANCE SCHEME covering Replacements can also be arranged.

For the convenience of customers who are unable to call during normal working hours, we are now open until 5 p.m. on Saturdays.



MODEL EXP 125 3 14-VALVE ALL-WAVE RADIOGRAM CHASSIS

5 Wave Bands covering from 10.9 to 550m and 800m to 2,000. R.F. Pre-Amplifier. Two I.F. Stages with Variable Selectivity. Bass and Treble Controls. 15-Watt Push-Pull Output. For A.C. Mains. **£36.15.0,** plus P.T.

MODEL RF 104 10-VALVE ALL-WAVE RADIO CHASSIS

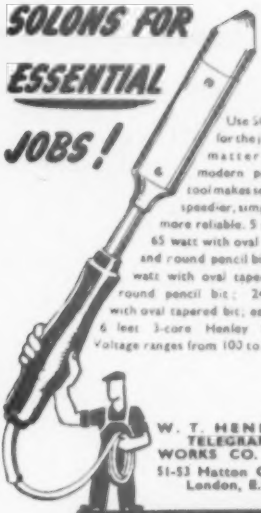
4 Wave Bands. R.F. Pre-Amplifier. Two I.F. Stages with Variable Selectivity. 10-Watt Push Pull Output. For A.C. Mains. **£24.0.0,** plus P.T.

MODEL EXP 73 8-STAGE ALL-WAVE RADIO CHASSIS

3 Wave Bands. Variable Selectivity. Flywheel Tuning. 8-Watt Push-Pull Output with Negative Feed Back. For A.C. Mains. **£17.15.0,** plus P.T.

ARMSTRONG WIRELESS & TELEVISION **CO. LTD.**
WARLTERS ROAD, HOLLOWAY LONDON, N.7
Telephone: NORth 3213

SOLONS FOR ESSENTIAL JOBS!



Use SOLONS for the jobs that matter—this modern precision tool makes soldering speed-er, simpler and more reliable. 5 models: 65 watt with oval tapered and round pencil bit; 125 watt with oval tapered and round pencil bit; 240 watt with oval tapered bit; each with 6 feet 3-core Henley flexible. Voltage ranges from 100 to 250.

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 Hatton Garden, London, E.C.1

HENLEY SOLON ELECTRIC SOLDERING IRONS

Write for Folder Y.10.

FOR INDUSTRIAL USE

BRASS, COPPER, DURAL, ALUMINIUM, BRONZE

ROD, BAR, SHEET, TUBE, STRIP, WIRE
3,000 STANDARD STOCK SIZES

No Quantity too Small *List on application*

H. ROLLET & Co., Ltd.
6 Chesham Place, S.W.1. *SLOane* 3463
ALSO AT
LIVERPOOL BIRMINGHAM MANCHESTER

ODDIE FASTENERS

PAT. 507249

THE FASTENER WITH ENDLESS APPLICATIONS - SIMPLE - POSITIVE SELF-LOCKING. MADE IN A VARIETY OF TYPES AND SIZES.

SPECIAL FASTENERS TO SUIT CUSTOMERS REQUIREMENTS.

WIDELY USED IN THE RADIO INDUSTRY.

Illustrated brochures and other informat on will be gladly sent on request.

DEPT. "W.W."

Oddie, Bradbury & Cull Ltd., Southampton
Tel.: 55883 Cables: Fasteners, Southampton

MISCELLANEOUS

METALWORK, all types cabinets, chassis, racks, etc., to your own specifications. PHILPOTT'S METAL WORKS, Ltd. (G4B1), Chapman St., Loughborough. [0208

ARE you aware that there are 5,000 radio apparatus dealers in the United Kingdom? We can send you by return of post, envelopes addressed to all or any section for 27/6 per thousand addressing cost. Send for our list of sections, etc.—H. J. BOULTING, Ltd., Bridge Rd. Works, Leicester. Te., 67252. [9254

ALLSCREWS, Ltd., for B.A. screws, nuts, washers, studding, grub-screws, bolts, soldering tags, woodscrews, etc.; plain or nickel or cadmium plated, one-gross packets or large quantities; stamp for lists.—270a, King St., Hammersmith, W.6. Riv. 7762. [0225

10 English Lever watch movements from gold and silver cases, accept 50/- the 10; 10 Geneva movements, 20/- the 10; 10 Swiss jeweled lever movements, 50/- the 10; very useful to watchmakers.—Merkel's Jewellers, Grey St., Newcastle-on-Tyne. Postage. [9225

DECALS, the modern method of marking panels, controls, etc., in book form, each book containing approx. 500 words and abbreviations, etc., covering every aspect of electronics, price 4/9 and 3d postage.—Alexander Engineering Ltd., Child's Place, Earls Court, S.W.5. [0245

ENGRAVING amateurs and trade could take the opportunity of engraving problems in the future by getting in touch with A.G. Engraving, 19a, Windmill Rd., London, S.W.18. Bat. 5795. Brass, bronze, etc. round. Perspex dials, one knob or repetition equally retained. [0054

COPPER wire: enamelled, tinned, Litz, cotton, silk covered; all gauges; B.A. screws, nuts, washers, soldering tags, eyelets, ebonite and laminated bakelite panels, tubes, coil formers, Tufnol rod, brackets, terminals, etc.; latest radio publications, full range available; list, s.a.e.; trade supplied.—Post Radio Supplies, 33, Bourne Gardens, London, E.4. [0158

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

TELEVISION Technicians.

LARGEST Independent Canadian Service Company, requires first-grade service men; permanent employment and good wages to reliable steady conscientious men; television in Canada is new and offers excellent opportunities for those who are not afraid to work.—APPLY to Capital Television, Limited, 9500, St. Lawrence Blvd., Montreal, Que., Canada., stating all qualifications and references; we will guarantee employment to those selected, but want only first-class men. [9285

SILVER CITY AIRWAYS, Ltd.

INVITE applications for positions as ground radio engineers from experienced persons keen to return to the aviation industry.—Blackbushe Airport, Camberley, Surrey. [9551

CROWN AGENTS FOR THE COLONIES.

TECHNICIAN, Grade I, required for radio work by East African Posts and Telecommunications Administration. Appointment will be on probation for permanent and pensionable employment. Commencing salary according to age and experience in scale £687 rising to £1,050 a year (including allowance). Outfit allowance £50. Free passages. Liberal leave on full salary. Normal tour is four years. Candidates aged 25-36 should possess a thorough practical knowledge of the working and maintenance of modern radio transmitting and receiving equipment. General Post Office employees should apply through departmental channels.—APPLY at once by letter, stating age, full names in block letters, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4 Millbank, London, S.W.1, quoting on letter M.29528/B. The Crown Agents cannot undertake to acknowledge all applications, and will communicate only with applicants selected for further consideration. [9225

RADIO and television testers, good rates, 5-day week.—Ace Radio, Ltd., Tower Rd., N.W.10. Wil. 5904. [9127

RADIO engineers/mechanics are required to fill posts in a development department, experience in handling modern transmitter and receiver equipment is essential; preference will be given to applicants with experience in development and construction of new communication equipment or other electronic apparatus; salary will be in the range £600 to £850 p.a., according to age and experience.—Write REM, Box 5120. [9218

TECHNICIANS between 20 and 30 years of age required for the initial and routine testing of relay wireless equipment including 1 kw audio amplifiers; applicants should have had some experience in the wire broadcasting, telephone or radio industries; possession of C. & G. and/or National certificates an advantage; commencing wage between £5.10 and £9 per week according to qualifications, etc.; 5½-day week, superannuation scheme and active sports and social club.—Applications in writing to Personnel Manager, British Relay Wireless, Ltd., 543-5, Walworth Rd., Southwark, S.E.17. [9356

It is the Savage Tradition that only the best is good enough and all employees are individually trained to take a pride in their work. Every instrument which leaves our works is the product of our conscientious best.

SAVAGE TRANSFORMERS DEVIZES LIMITED

SAVAGE TRANSFORMERS LTD.
Nursteed Road, Devizes, Wilts.
Telephone: Devizes 53

RADIO G200 OFFERS

50 Ampere Rectifier Units Type 11A. Ref. SA/2247, S.T. & C. Rated as follows:—36V, 50A., at 50°C., input 380-440 Volts 50 c/ps. 3ph. Price **£25** each.

EXPORT—IMPORT

ARTHUR HOILE 55 UNION STREET MAIDSTONE, KENT
Telephone 2812

THE AMOS & JOHNSTONE

F.M. FEEDER UNIT

for 87·5—100 mc/s
(SEPTEMBER ISSUE)

is Simple & Inexpensive

SMITHS of EDGWARE ROAD

can supply the complete set of parts as used by the designers, with chassis ready drilled, for **70/-** (less valves and diodes).

All components for their "Sensitive T.R.F. Receiver" (Nov. 1951) still available. Reprint 1/-.

Priced component list on receipt of S.A.E.

H. L. SMITH & CO., LTD.
287/289 Edgware Road, London, W.2
Telephone Paddington 5891
Hours 9 till 6 (Thursday, 1 o'clock)
Near Edgware Road Stations, Metropolitan & Bakerloo

GEE—RADIO LTD.

METAL RECTIFIERS

Volts	Amps.		Price
230	1½	F.Wave	80/-
230	½	"	30/-
110	½	"	27 6
50	½	"	19 6
24	10	"	80/-
24	6	"	35/-
24	2½	"	25/-
24	1	"	13 6
12	10	"	40/-
12	6	"	25/-
12	4	"	18 6
12	2½	"	16 6
12	2	"	12/-
12	1	"	7 6
6	1	"	7 6
RM1–125 v.	60 mA.	H.Wave	4 6
RM2–125 v.	80 mA.	"	5/-
RM3–125 v.	100 mA.	"	6/-
RM4–250 v.	250 mA.	"	18 6
GEE4–250 v.	250 mA.	"	14 6
K3.160–5.6 kv.	1 mA.	"	21 6
K3.100–7 kv.	1 mA.	"	14 6
K3.50–4 kv.	1 mA.	"	8 6
K3.45–3.6 kv.	1 mA.	"	8 2
K3.40–3.2 kv.	1 mA.	"	7 6
K3.25–2,000 v.	1 mA.	"	5 6
J 50 400 v.	2 mA.	"	6 9
J 25 250 v.	2 mA.	"	3 6
36 EHT 25 1.8 kv.	2 mA.	"	13 6
36 EHT 35 2.5 kv.	2 mA.	"	17 6
36 EHT 40 2.9 kv.	2 mA.	"	£1 - -
36 EHT 45 3.4 kv.	2 mA.	"	£1 2 6
36 EHT 50 3.6 kv.	2 mA.	"	£1 4 0
36 EHT 100 7 kv.	2 mA.	"	£1 8 9

RECTIFIER SETS IN METAL CASES: A.C. volts 65 cycles 16 2 3rd. cycles. (Can be used for 50 cycles.) Output D.C. volts 57 amps. 0.05 0.25. Price £1, carriage 5/-.

METER REC., 5 mA., F.Wave. 7 6.

SELENIUM METAL RECTIFIERS BUILT TO INDIVIDUAL REQUIREMENTS. YOUR ENQUIRIES INVITED. SPEEDY DELIVERY.

R1155 RECEIVER. Brand new, in perfect condition in original transit case. Each instrument tested under correct working condition before despatch. **£9 19 6.** Suitable power unit with built-in output stage. **£3 10/-.** Carriage: 1155, 10/-; Power unit, 7/6.

ROTARY CONVERTERS. 12 v. D.C. input to 230 v. A.C., 50 cycles output. Approx. 150 watt. Complete in wooden carrying case, containing voltage control, sliding resistor, mains switch, input and output sockets. Ex-Govt., in perfect order. **£9**, carriage paid. 24v. D.C. to 240v. A.C., 120 watts, in original transit case, 95/-, carriage 5/-. Ex-Govt., in perfect order.

SPEAKERS AT PRE-PURCHASE TAX PRICES:

10in. Bronze Wharfedale 15 ohms	69 6
10 in. P.M. 3 ohms Plessey	20/-
8in. P.M. 3 ohms Plessey	14 6
6½in. P.M. 3 ohms	14 6
5in. P.M. 3 ohms Goodmans	12 6
2½in. Plessey	13 6
8in. P.M. W.B 3 ohms Stentorian	32 6

P. & P. 1/6 all speakers.

No. 19 POWER UNITS, MKII 25/-. P. & P. 2/6.

MANSBRIDGE CONDENSERS, 2 m/d. 4,000 v. working. 15/-.

VACUUM CONDENSERS, 50 m.m.f., 20 kv. and 32 kv. £1.

803 CERAMIC VALVE BASES. 12 6.

"BURLEC" (CANADIAN) POWER UNITS, 110 v. D.C. at 3 amps. to 110 v. 60 cycles at 3 amps. Complete in metal cases. 22 6 carriage paid.

ALUMINIUM SHEET. Undrilled 16 s.w.g. Sizes available: 12in. x 12in., 24in. x 12in., 24in. x 24in., 24in. x 36in., 5/- per sq. ft.

WIRELESS REMOTE CONTROL UNITS. "E" MK11 ZA 11954. **£3 10 0**, carriage paid.

Terms. C.W.O., C.O.D. or pro-forma invoice. Orders under 20/-, please add 1/6 p.p. unless otherwise stated. Special quotation for overseas buyers.

15 LITTLE NEWPORT ST., LONDON, W.C.2

GERrard 6794/1453

SITUATIONS VACANT

CROWN AGENTS FOR THE COLONIES.

WIRELESS station superintendent required by the Government of Nigeria for the Posts and Telegraphs Department for one tour of 18 to 24 months in the first instance with prospect of permanency. Salary (including expatriation pay) between £750 and £1,175 a year, according to qualifications and experience. Outfit allowance £60. Free passages for officer and wife and assistance towards cost of children's passages of their maintenance in this country. Liberal leave on full salary. Candidates (under 40 years) must have had wide practical experience of modern radio techniques and equipment, in particular V.H.F. equipment, and preferably also V.H.F. multi-channel equipment.—Apply at once by letter, stating age, full names in block letters, and full particulars of qualifications and experience and mentioning this paper to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting on letter M.28927/B. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. [9211

THE CROWN AGENTS FOR THE COLONIES.

WIRELESS Operator Mechanic required for the Falkland Islands Dependencies Survey for one tour of 18 or 30 months in the first instance. Salary according to qualifications and age in scale £250 rising to £415 a year. Duty allowance £40 a year. Quarters, subsistence, clothing and liberal routine canteen stores are provided free of charge while serving in Dependencies; it is possible for officers to save almost all emoluments. Liberal leave on full salary. Candidates must be able to transmit and receive morse at 25 words a minute (plain language or code) and be capable of elementary maintenance of wireless transmitting and receiving equipment. Apply at once by letter, stating age, full names in block letters, and full particulars of qualifications and experience and mentioning this paper to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting on letter M.29387/B. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. [9230

COTTAGE LABORATORIES, Ltd., require:—

ASSISTANT Engineers interested in electronics. THERE are prospects of rapid promotion in an expanding laboratory.
FIVE-DAY week, excellent canteen and active sports club.
APPLY, stating age, nationality, previous experience and salary required, to the Manager, Cottage Laboratories, Ltd., Portsmouth Rd., Cobham, Surrey. [9227

COIL TESTERS are required in the following grades:—
(1) SENIOR coil tester to undertake and supervise work in a small group, and (2) assistant coil testers.
APPLICANTS for the senior grade should have previous experience of testing, measuring and adjusting coils and transformers and must also be familiar with all normal electronic test equipment, bridge methods, etc. Applicants for the assistant grade need not possess detailed experience in these fields, but a basic knowledge of electrical theory will be a distinct advantage.
THE positions are permanent and open to members of either sex, and the salaries offered will be commensurate with age and previous experience. Working condition are ideal, with pleasant and congenial surroundings, excellent canteen facilities available on the premises, active sports club, and a five day week.
APPLICANTS should write stating age, nationality and previous experience to—Cottage Laboratories, Ltd., Portsmouth Rd., Cobham, Surrey. [9267

SKILLED craftsmen required by Government department in Cheltenham.
(A) INSTRUMENT makers who have served a recognised apprenticeship in that trade or have had equivalent experience in light engineering.
(B) RADIO, teleprinter and electronic mechanics also assembler testers with experience of telecommunication equipment. Basic pay £6/12 plus merit pay up to £2/10 per week according to skill and experience; opportunities of securing permanent and pensionable post.—Apply Box 3399. [9275

THE PLESSEY Co., Ltd., propose to make the two following appointments:—
(a) SENIOR Radio Engineer.
(b) SENIOR Television Engineer.
APPLICATIONS are invited from men who have the technical qualifications, initiative and organising ability which will enable them to control a laboratory concerned with the development and design of commercial television receivers and commercial radio and communication equipment respectively for mass production. These posts carry considerable responsibility and commensurate salaries will be paid.—Applications, which will be treated in strict confidence, to the Joint Secretary, The Plessey Co., Ltd., Ilford, Essex. [9294

ROYAL Buckinghamshire and Associated Hospitals Management Committee.
ELECTROENCEPHALOGRAPHIC Department.
RECORDIST required for this new department at St. John's (Mental) Hospital, Stone, Aylesbury (770 beds); salary £300×£15—£360.—Applications stating age and experience, with names of two referees to the Physician-Superintendent. [9256

PERSONAL Assistant of high ability and integrity, required by owner of retail radio and electrical business of good standing; state age and full details of career.—Box 1631. [9529

BARKER SOUND UNITS AT NEW PRICES DIRECT TO YOU ARE SUPREME VALUE IN NATURAL SOUND

The basic price of the famous Barker 148a is now only 230/-. This is a lot lower than it, or any comparable sound unit, has ever been before, and even with P.T. it is amazing value. No other unit in the world, at any price however high, can offer all these features:—

DUAL DRIVE WITH BUILT-IN CROSSOVER

FEED-BACK GIVING CRITICAL DAMPING

GRADED COMPLIANCE HAND-MADE CONE

FULL AUDIO RANGE

NO RESONANCES OR BREAKS IN QUALITY

PIN-POINTED DETAIL CRYSTAL TRANSIENTS

INCOMPARABLE NATURALNESS

The 148a is a full 12in. unit with die cast frame, high flux magnet and everything which craft skill, personal care and individual attention can give.

YOU DESERVE ONE FOR XMAS

WRITE DIRECTLY TO:—

BARKER NATURAL REPRODUCERS

3 Newman Yard, London, W.1

for **ONE MONTH** only

★ AMAZING BARGAINS IN

ELECTRIC MOTORS

1/6 H.P. HOOVER STANDARD MOTOR. SHOCK MOUNTED, 1450 r.p.m., 200-220-230 A.C. Single Phase. Capacity Start. Perfect condition. **£3.5.0.**

1/6 H.P. G.E.C. SHOCK MOUNTED, 1450 r.p.m., 220-230 volt A.C. Single Phase. Capacity Start. 2in. x 5/8in. spindle. Brand new. **£3.15.0.**

¼ H.P. HOOVERS. Brand new and cartoned. 200-210 volt A.C. 1450 r.p.m. Shock mounted. Capacity Start. ¼in. spindle. Will run perfectly on 230 volts. Special price. **£4.0.0.**

1/3 H.P. HOOVER. Brand new and cartoned. 200-210 volt A.C. 1450 r.p.m. Shock mounted. Capacity Start. ¼in. spindle. Suitable for 220-230 A.C. Amazing price. **£4.7.6.**

Money Refund Guarantee

ALL PRICES INCLUDE CARRIAGE

Scotland and England only

M. & J. PEARSON

263 GALLOWGATE, GLASGOW, C.4.

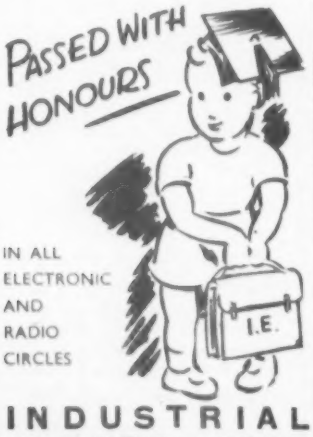
QUALITY TELEVISION COMPONENTS

HR

Scanning Coils
6/10 Kv. E.H.T. Units
E.H.T. and Output Transformers
Line Fly-back E.H.T. Units
"TELEVISION CIRCUITS"
6th Edition 3/6.

HAYNES RADIO Ltd.

Queensway · Enfield · Middlesex



IN ALL ELECTRONIC AND RADIO CIRCLES

INDUSTRIAL ELECTRONICS

SITUATIONS VACANT

A. V. ROE & Co., Ltd., have a vacancy in their engineering research department on interesting development work for an ELECTRONIC engineer.
PREFERABLY with knowledge of electronic equipment used in vibration testing, some knowledge of vibration and fatigue an asset.
APPLICANTS for the above post should possess at least Higher National Certificate or equivalent.
GOOD salary and prospects.
PENSION and life assurance scheme.
APPLY, stating age, qualifications and experience, to
THE Labour Manager, A. V. Roe & Co., Ltd., Greengate, Middleton, Manchester. [9251

FERRANTI, Ltd., Moston, Manchester, have the following vacancies for work in connection with the development of
CATHODE RAY TUBES for Television, Oscillography and special purposes:—
(1) SENIOR engineers and scientists to take charge of research and development sections. Applicants should have a good degree in physics, electrical engineering or glass technology, and have had experience in supervising development work. Salary according to qualifications and experience, in the range £750 to £1,250 per annum. Please quote reference GCT/1.
(2) ENGINEERS and scientists for work in the following fields:—
Thermionic emission, vacuum techniques, electron optics, photo-electric phenomena, electronic circuits, glass technology and high-voltage techniques.
Qualifications include a good degree or equivalent. Previous experience would be an advantage, though not essential. Salary according to qualifications and experience, in the range £450 to £1,000 per annum. Please quote reference GCT/2.
(3) MECHANICAL or production engineers to undertake the development of machinery for mass-production of electronic devices. Qualifications, etc., as in (2). Please quote reference GCT/3.
(4) TECHNICAL assistants for experimental work in the fields listed in (2) above. Qualifications are a degree or Higher National Certificate. Salary range £400 to £600 per annum according to age and qualifications. Please quote reference GCT/4.
The Company has a Staff Pensions Scheme.
Application forms from Mr. R. J. Hebbert, Staff Manager, Ferranti, Ltd., Hollinwood, Lancs. Please quote appropriate reference. [8975

TECHNICAL writer for installation and service notes by S.W. London manufacturer of radio and television receivers. Box 3365. [9269

RADIO and television service engineer, able to drive, perm. situation for 1st class man.—Hammants, Bell St., Henley-on-Thames. [9517

SENIOR Electronic Development Engineer required to take charge of engineering associated with guided weapons and like projects.
ELECTRONIC Development Engineers also required for the same projects.
REPLY stating age, qualifications and experience, to Staff Manager (Ref. R.G.), G.E.C., Stanmore Laboratories, The Grove, Stanmore Common, Stanmore, Middlesex. [9155

MANAGER required for provincial piano & radio television and record shop; must be fully experienced and mobile.—Write Box 3250. [9249

ELECTRONIC engineer required by well-known North London company, wide knowledge of low-frequency circuit techniques with sound design ability.
THE laboratory specialises in industrial and medical electronic apparatus for small-scale production. degree, corporate membership of I.E.E. or equivalent required, interesting variety of work with good opportunities, pension scheme, etc.
WRITE, quoting reference "W.W.," stating education, experience and salary required to Box 3265. [9253

DRAUGHTSMEN.—Air Trainers, Ltd., require several senior and junior electrical and mechanical draughtsmen for work in connection with the development of flight simulators as follows:—
(a) ELECTRICAL Draughtsmen for design work on electronic servo amplifiers.
(b) MECHANICAL Draughtsmen for design work on simulated aircraft instruments and flight mechanisms.
SALARY scale: A.E.S.D. plus Merit for juniors. Up to £11/5 per week for seniors. Positions permanent. Pension Scheme. Five-day week. Applicants should reply, stating experience and qualifications, to:—
PERSONNEL Officer, Air Trainers, Ltd., Bicester Rd., Aylesbury, Bucks. [9012

E. K. COLE, Ltd. (Malmesbury Division), invite applications from electronic engineers for permanent posts in development laboratories engaged on long-term projects involving the following techniques:—
1. PULSE Generation and Transmission.
2. SERVO Mechanism.
3. CENTIMETRIC and V.H.F. Systems.
4. VIDEO and Feedback Amplifiers.
5. V.H.F. Transmission and Reception.
6. ELECTRONICS as applied to Atomic Physics.
THERE are vacancies in the Senior Engineer, Engineers and Junior Grades. Candidates should have had at least 3 years' industrial experience in the above types of work, together with educational qualifications equivalent to A.M.I.E.E. examination standard. Commencing salary and status will be commensurate with qualifications and experience. Excellent opportunities for advancement are offered with entry into a pension scheme after a period of service.—Forms of application may be obtained from Personnel Manager, Ekco Works, Malmesbury, Wilts. [8719

This Month's Offers

D.C. DYNAMOS. Shunt wound 14/32 volts 9 amps., G.E.C., for lighting or charging 12-18 or 24 volt batteries; 2,500 r.p.m., **70/-**, carr. 5/-; 12 volt 6 amp. shunt wound, Smiths, 1,400 r.p.m., for wind charging 4-brush type with pulley, **55/-**, carr. 5/-; 24 volts 28/30 amps., 900 r.p.m. shunt, new cond., **£25**, carr. 10/-; 12 volts 50 amps. 750/975 r.p.m., by Simms, **£25**, carr. 10/-; 24 volts 300 amps., Newton, 2,500 r.p.m., **£12 10/-**, carr. 10/-; 24 volts 1,000 watts high speed, **£5 10/-**, carr. 5/-.

PUMPS. Semi Rotary hand pumps, 6in. dia., new cond., self priming, with fixing holes, **45/-**, carr. 2/6.

METERS. Universal Avo-minor, in leather case. Avo Test Bridge, Avo All wave Oscillator, few only, as new. Electrostatic Voltmeter, Ferranti, 0-600 volts, in Table case, **60/-**; 2½in. Electrostatic voltmeter, 3,500 volts, **55/-**; 1,500 volts, **55/-**. Write for list.

ROTARY CONVERTERS. We have a large stock, 24 volts, 110 volts, 230 volts D.C. input for A.C., 230 volts output from 100 watts to 3 kW., all as new and tested, by leading makers. Send for list.

METAL RECTIFIER UNITS. Westinghouse, 50 volts 10 amps. D.C. output, 50 volts 1½ amps. D.C., 110 volts ½ amp. 12 volts 16 amps. D.C., 24 volts 26 amps. D.C. All from 230 volts A.C. mains. Send for list.

MOTORS. 24 volts D.C., new, totally enclosed 4 hole fixing, series wound, laminated field work from 230 volts A.C. mains through transformer, **22/6**, post 1/6. 1/10 h.p. fan Motors, 230 volts A.C., 2,800 r.p.m., totally enclosed, **25/-**, post 2/-. Evershed 20 volts D.C. Motor, 1,300 r.p.m., with governor, **25/-**, post 1/6.

THE TINY TOWNSEND BUZZER, the smallest made, used by Govt. on Wavemeters, plat. contacts, sweet high note, **5/-**, post 6d.

ELECTRADIX RADIOS

Dept. A, 214 Queenstown Road, London, S.W.8

Telephone : MACaulay 2159

"QUIXO" RADIO Cell Tester

Accurate tests High, Low and Grid Bias Batteries. Write for leaflet 30M

RUNBAKEN MANCHESTER 9

100 kcs. QUARTZ CRYSTAL UNIT *Type* Q5/100

for Secondary Frequency Standards

★ Accuracy better than 0.01%. ★ Temperature coefficient 2 parts in a million per degree Centigrade temperature change. ★ Gold electrodes applied by cathodic sputtering direct to the faces of the crystal, giving permanence of calibration. ★ Simple single valve circuit gives strong harmonics at 100 kcs. intervals up to 20 Mcs. ★ Octal based mount of compact dimensions. PRICE **45/-** Post Free

Full details of the Q5/100 including circuit are contained in our leaflet Q1. Send stamp today for your copy.

THE QUARTZ CRYSTAL Co. Ltd.

63-71 Kingston Road, NEW MALDEN, SURREY

Telephone : MALden 3334

MAKE YOUR OWN CAR RADIO!

CONSTRUCTIONAL DETAILS

FREE

WITH OUR

NEW

HOME CONSTRUCTORS HANDBOOK

CONTAINING

15

TRIED AND TESTED CIRCUITS

of

T.R.F. SETS

4, 5 AND 6 VALVE SUPERHETS

A.C., A.C. D.C. and BATTERY SETS

TEST EQUIPMENT

FEEDER UNITS

AMPLIFIERS

ETC.

WITH

FULL CONSTRUCTIONAL DETAILS

FOR AN

EFFICIENT, STABLE, CRYSTAL RECEIVER

AND A LOW COST

SUPERHET COIL PACK

LOTS OF TECHNICAL INFORMATION, TOO!

PRICE **2/6** POST FREE

With full Illustrated Catalogue.

SEND FOR YOUR COPY TO-DAY!

BARGAIN BASEMENT

I.F. TRANSFORMERS, aligned, 465 Kc/s, air-cored, with trimmers ..... 12/6 pair
Iron dust cored ..... 16/6 pair
VARIABLE CONDENSERS, .0005, 3-gang (famous manufacturer) 12/- each
HEAVY DUTY CHOKES, 20H, 120 mA. ..... 19/6 each
STANDARD SUPACOILS, iron-cored. Aerial, H.F. or Osc. All wave ranges ..... 3/- each
TRF COILS, dual range ..... 3/- pair
JB COMPONENTS stocked, including SLB dials ..... 27/6 each
SLS DRIVE ..... 26/6 each
FULL VISION DRIVE ..... 13/- each
CALIBAND DRIVE ..... 21/6 each
Postage on above: 6d. under 10/-, 1/- up to £2. Post free over £2.

SUPERCOILS MAIL ORDER OFFICE

98 Greenway Avenue, London, E.17

SITUATIONS VACANT

EXPERIENCED T/V radio engineer, age 25-35 years, competent driver, for bench and outside work; Middx area, near Harrow.—Box 3494. [9297

EXPERIENCED TV engineers required for retail service, permanent positions at good salary.—Full details to Shenstones (op. Town Hall), Leyton, E.10. Ley 1362. [9266

REQD. imm., lab. techn. permt. pensionable, at Poplar Tech. Coll., Poplar High St., E.14, in elect. and phys. lab.; know. of instrument making and repair an adv.
PAY 68/- wkly. at 16 to 96/- at 19; £270 a yr. at 20; £18 more for each full year of age above 20 on entry, best max. comm. sal., £342. Ann. incrs. £18 to £378 and with specld. qualns. to £414.
APPLY within 14 days on form from coll. sec. (10c7). [9241

MULLARD EQUIPMENT, Ltd., of Erathway Rd., Wandsworth, S.W.18, are requiring technical and senior draughtsmen experienced in electronic instruments and radio, salary range:—
TECHNICAL draughtsmen, £8/5—£9/15 p.w.
SENIOR draughtsmen, £9/5—£11 p.w. (according to age and experience).
CANTEEN facilities and pensions scheme, etc.
APPLY in writing, giving full details of experience and qualifications, to Personnel Department, Mullard Equipment, Ltd., 51-55, Garratt Lane, S.W.18. [9356

QUALIFIED engineer required for television aerial and transmission line development and research for laboratory situated in the Bucks area, wide experience of S.W. aerial measurements essential.
PERMANENT position offered with liberal salary to suitable candidate.—Write Antiference, Ltd., 67, Bryanston Street, London, W.1. [9324

EXPERIENCED television and radio tester required by manufacturers, permanent position; capable engineer can progress to development work; apply by letter in first instance, giving full details of experience, etc.
ARMSTRONG WIRELESS & TELEVISION CO., Ltd., Workers Rd., Holloway, N.7. [9262

D. NAPIER & SON, Ltd., Luton Airport, Beds. require electronics laboratory assistant, familiar with C.R.O. practice, keen on development of new techniques for experimental work on aero engine development and allied projects.
APPLICATIONS stating age, experience and salary required should be made to the local Employment Exchange. [9504

ENGINEER required for design and development work on magnetic amplifiers and small transformers; previous experience on design and manufacturing methods essential; considerable scope for original work.—Apply, Box 3137. [9226

LABORATORY assistant required for vacuum tube experimental laboratory, National Service completed, 5-day week; canteen facilities, pension scheme. — Cinema-Television, Ltd., Worsley Bridge Rd., Lower Sydenham, S.E.26. [9502

WORKS manager wanted by light electrical engineers in S.E. London with coil-winding, machine and assembly shops and employing 450.—Write, stating age, qualifications, detailed experience and salary expected Box 3286. [9254

DEVELOPMENT engineers, senior and junior, for radio, television and electronics, North London area; previous experience of circuit development work essential; details of qualifications, experience and salary required to—Box 3509. [9501

SALES Representative required by Surrey firm specializing in the manufacture of Ceramic materials and components for electrical and radio applications; full details of previous experience and salary required should be given.—Box 3139. [9230

SALES engineer, electronic equipment, required by London group of small companies, exceptional opportunity for young engineer with some selling experience; send full details, date of birth and indication of salary required to—Box 3125. [9261

BUSH RADIO, Ltd., have vacancies in their test gear laboratory for development engineers; apply by letter giving full details of experience, qualifications, age and salary to the Personnel Manager, Bush Radio, Ltd., Power Rd., Chiswick, W.4. [9258

EXPERIENCED radio testers and inspectors required for production of communication and radio apparatus also instrument makers, wirers and assemblers for factory test apparatus.—Apply Personnel Manager, E. K. Cole, Ltd., Ekco Works, Malmesbury, Wilts. [9238

TECHNICAL sales engineer, a technical representative able to discuss requirements of signal generators, constant voltage transformers and associated equipment; apply stating experience, age, etc., in confidence to—The Secretary, Advance Components, Ltd., Back Rd., London, E.17. [9261

FERRANTI, Ltd., require for their Radio and Television Department a radio engineer to design production test gear and to be responsible for maintenance and modification of existing equipment; a man of H.N.C. or equivalent qualifications with some experience of modern radio practice is needed.
PERMANENT staff appointment with pension benefits and good prospects of advancement; salary in the region of £8-£11 per week.
FORMS of application from Mr. R. J. Hebbert, Staff Manager, Ferranti, Ltd., Hollinwood, Lancs.
PLEASE quote reference HW/T. [9314

ALPHA OFFERS

MAINS TRANSFORMERS

MT1 PRIMARY, 200-220-240 v. SECONDARIES, 250-0-250 v. 80 m.a., 0-4 v.; 5 a.—6.3 v.; 4 a. 0-4 v.-5 v. 2 a., **17/6** each. **MT2** as above, but with 350-0-350 H.T. winding, **17/6** each.

AUTO TRANSFORMER

0-10-120-200-230-250 v. 100 watts, **17/6** each.

MT3 PRIMARY, 200-220-240 v. SECONDARIES, 30 v. 2 amp. with tappings at 3 v., 4 v., 5 v., 6 v., 8 v., 9 v., 10 v., 12 v., 15 v., 18 v., 20 v., 24 v.

COLLARO AC37 RECORDING MOTOR

Variable speed 0-100 r.p.m., 100/125 v., 200/250 v. Spindle ¼in., **32/6** each. Post 1/6.

METAL RECTIFIERS

12 v. ½ amp., **1/6** each. 2 to 6 v. 1 amp., **2/-** each. 250 v 45 m/a., **6/9** each. 250 v. 75 m/a., **7/6** each. 12 v. 5 amp., **18/6** each. 14D36, **8/6** each.

CHOKES

Large type 5 H 250 m.a., **8/6** each. Midget type 10 H 250Ω 45 m.a., **2/6** each. Standard type 120 m/a., **5/-** each.

ALLADIN COIL FORMERS

¼in. and ⅜in. with Iron core slugs, **9d.** each.

TRUVOX

Heavy duty 12in. P.M. Speaker, 15Ω, **£6/10/-** each. Carriage 3/-.

VOLUME CONTROLS, all by Famous Manufacturers

100 k ohms, ¼ meg., ½ meg., 1 meg., 2 meg., all with Single Pole Switch, **3/9** each. 50 k, ¼ meg., ½ meg., 1 meg., less Switch, **2/6** each. ¼ meg., 150 k ohms Midget Type, **1/9** each. 1 meg. Log. S.P.S., **4/9** each. 1 meg. D.P.S., **5/-** each. SPECIAL OFFER 1 meg. S.P.S. Short 1in Spindle, **3/-** each. ¼ meg., ½ meg., 1 meg., with S.P. Switch, **3/6** each. 25 k ohms less Switch, **1/6** each. 1 meg. with D.P.S., **5/-** each. **Egen**—5 k ohms, with S.P. Switch, **3/6** each. ¼ meg. with Double Pole Switch, **4/6** each. 5 k ohms, 150 k ohms, less switch, **1/6** each. 25 k ohms, 50 k ohms, ¼ meg., 2 meg. with D.P. Switch, **5/-** each. ¼ meg. with S.P. Switch, **4/-** each. **Wire wound types**—10 k ohms, 5 ohms, 200 ohms, 1 k ohms, **2/-** each. 20 k ohms, 25 k ohms, 35 k ohms, 50 k ohms, **3/-** each. 10 ohms, 500 ohms, 1 k ohms with Switch, **2/10** each. Double 10 k ohms on one Spindle, **3/3** each. Midget 400 ohms, **2/-** each. Solid Dielectric Condensers, .0001, .0002, .0003, .0005, **3/10** each. JB SLS Spin wheel drive, **27/6** each. JB SLS RV Drive, **26/6** each. Full list available.

THIS MONTH'S OUTSTANDING BARGAINS

8 mfd. 350 v., **1/3** each. 32 mfd. 350 v., **1/6** each. 25 mfd. 25 v. D.C., **1/3** each. Octal Grid Caps, **6d.** doz. Jack Sockets, **6d.** each. ½ meg. less switch, **1/6** each. ½ meg. 100 kΩ V/C SPS, **2/9** each.

SPECIAL PURPOSE VALVES

VR123 (EF8), **7/6** each. 954, **2/9** each. 955, **5/-** each. 956, **3/3** each. VR136 (EF54), **6/-** each. VU111, **4/6** each. E1148, **2/-**. VR150/30, **9/-** each. VU120A, **4/-** each. CV71, **1/-** each. TT11, **6/6** each. 7193, **2/-** each. E1436, **3/9** each. ATP4, **6/-** each. VGT128, **7/6** each. BL63, **7/6** each.

SPEAKERS

3½in., **13/6**; 5in., **12/6**; 6½in., **13/-**; 10in., **19/6**; R.M. Extension Brown Bakelite case, **39/6** each.

TERMS: Cash with order or C.O.D. MINIMUM C.O.D. Fee and Postage 2/3.

Full list available, send 3d. in stamps.

MAIL ORDER ONLY

POSTAGE—Please add 6d. to 10/-, 1/- to 20/-, 1/6 to 40/-.

ALPHA RADIO SUPPLY CO.

5/6 Vinces Chambers, Victoria Square LEEDS, 1

NEW G.E.C., S.T.C. AND "WESTALITE" SELENIUM RECTIFIERS. Largest L.T. range in Great Britain. Latest Current Products. NOT Surplus.

DECEMBER'S PRICE LIST.

G.E.C. (BRIDGE). 12 v., 1 a., 2 a., 3 a., 4 a., 6 a., 10 a.
24 v. 1 a., 2 a., 3 a., 4 a., 6 a., 10 a., etc., prices next month, all low priced.

S.T. & C. HALF WAVE. 30 v. 8 a., 54/-, Post 1/6. 100 v. 2 a., 49/6; 4 a., 92/-, Post 1/-.

BRIDGE CONNECTED FULL WAVE. 17 v. 1.2 a., 16/6; 1.6 a., 26/-; 2.5 a., 29/-; 3 a., 30/-; 4 a., 34/6; 5 a., 37/6, all post free. 33 v. 0.7 a., 24/3; 1 a., 28/-; 1.5 a., 45/-; 2 a., 51/-; 3 a., 52/-; 4 a., 62/-; 5 a., 67/-; all post 1/-. 54 v. 1 a., 30/6; 1.5 a., 62/-; 2 a., 69/-; 3 a., 70/-; 5 a., 93/-; 72 v. 1.5 a., 79/-; 2 a., 81/-; 3 a., 92/-; 5 a., 132/-; 100 v. 1.5 a., 112/-; 2 a., 128/-; 5 a., 174/-; all post 1/2.

BRIDGE CONNECTED HEAVY DUTY 7/in. SQUARE COOLING PINS. 17 v. 6 a., 49/6; 10 a., 56/-; post 1/6.

BRIDGE CONNECTED HEAVY DUTY Funnel Cooled, also

7/in. SQUARE COOLING PINS. Revised price, same both types. 17 v. 12 a., 102/-; 20 a., 118/-; 30 a., 164/-; 50a., £12 15/-; 33 v. 6 a., 91/-; 10 a., 104/-; 12 a., 168/-; 20 a., 180/-; 54 v. 6 a., 120/-; 10 a., 142/-; 72 v. 6 a., 154/-; 10 a., 178/-; 100 v. 6 a., £11; 10 a., £12 15/-; all post 1/10.

"WESTALITE" (BRIDGE). 12-15 v. D.C., 1.2 a., 18/9; 2.5 a., 27/6; 5 a., 31/9; 10 a., 54/6; 20 a., 99/6; 30 a., 144 10/; 24 v. 1.2 a., 15/9; 2.5 a., 27/6; 5 a., 10 a., 92/7; 20 a., 176 2/; 36 v. 1.2 a., 27/6; 2.5 a., 31/-; 5 a., 69 10/; 10 a., 130 9/; post extra.

Wholesale & Retail

T. W. PEARCE (Est. 21 Yrs.)
86 GREAT PERCY STREET, LONDON, W.C.1
Off Pentonville Rd. Between King's Cross and Angel.

LOCKWOOD
makers of
Fine Cabinets
and woodwork of every description for the Radio and allied trades
LOCKWOOD & COMPANY
Lowlands Rd., Harrow, Middlesex. Byron 3704

AMATEUR TRANSMITTING LICENCE

Pass the
G.P.O. MORSE CODE TEST
the speedy way—

Enrol for the **CANDLER SPECIAL COURSE** which includes all essential training to enable the average student to be successful. The fee is reasonable too.

Write now for the
CANDLER
"BOOK OF FACTS"
stating which course you are interested in

(1) **Special Course** for G.P.O. Morse Code test for Amateur Transmitting Licence.
(2) **Candler Junior Course** for Beginners.
(3) **Candler Advanced Course** for Operators who desire to increase their speeds and accuracy.

Courses supplied on cash or monthly payment terms.

THE CANDLER SYSTEM CO.
(Dept. 54W)
52b ABINGDON ROAD, LONDON, W.8
Candler System Company, Denver, Colorado, U.S.A.

SITUATIONS VACANT

SALES representative required with knowledge of market for ceramic parts and components; full details of previous experience and salary required.—Box 3544. [9555

PYE TELECOMMUNICATIONS, LTD., Ditton Works, Cambridge, will shortly have vacancies for senior and junior engineers; experience in V.H.F. design and engineering is essential; vacancies also exist for engineers with specialist experience in multi-channel V.H.F. telephony. SALARY according to qualifications and experience.
PLEASE apply, stating age, qualifications and experience to the Personnel Manager. [9280

THE ENGLISH ELECTRIC Co., Ltd., Luton, has vacancies for three young men for training as functional test inspectors. Applicants must have technical background, a minimum qualification of Ordinary National Certificate, or equivalent, and some previous experience in one or more of the following:—
(a) Servos systems.
(b) Small electrical instruments.
(c) Hydraulics or pneumatic systems.
(d) Radar.
(e) Electronics.
INITIAL training will be considered in some cases. These are staff appointments with excellent prospects for those willing to expand their technics, knowledge and accept responsibility. Applications stating age, experience and qualifications, should be sent to—Central Personnel Services, English Electric Co., Ltd., 536, Strand, W.C.2, quoting reference 1025B. [9246

ELECTRONIC Engineer required with preferably 6 years' experience of design and development on audio frequency electronic equipment; degree or equivalent necessary.—Write, giving details of qualifications, experience and salary required, to the Labour Manager, Rolls-Royce, Ltd., Derby. [9126

RADIO service mechanics are required by S. Smith & Sons (England), Ltd., of Cricklewood, N.W.2; starting at £8/5 per week, plus profit sharing bonus, there are good prospects of advancement together with canteen facilities and a five-day week.—Write for interview to Personnel Officer (Radiomobile). [0242

SENIOR mechanical design draughtsmen required with experience of electronic layouts for work on guided weapons and like projects.—Reply, stating age, qualifications and experience to Staff Manager (Ref. R.G.), G.E.C., Stanmore Laboratories, The Grove, Stanmore Common, Stanmore, Middlesex. [9146

ELECTRICAL engineer, knowledge of electronics required, N.W. London instrument manufacturing company for research laboratory; should possess H.N.C. with experience in this field, prepared to undertake work requiring enterprise and initiative; write details qualifications, experience, salary required—Box 3445. [9266

ELECTRICAL assistant required for an industrial metallurgical research laboratory in the S.E. London area, to help with problems connected with furnace control equipment; national certificate in electrical engineering a minimum requirement, with some knowledge of electronics an advantage.—Write, giving full details, to Box 2675. [9110

GLOSTER AIRCRAFT Co., Ltd., of Hucclecote, Glos., have vacancies for electrical draughtsmen; previous aircraft experience an advantage but not essential; prospects are excellent for energetic and sound applicants.—Applications to be addressed to the Chief Designer, giving particulars of experience, age and salary required. [0226

PHYSICISTS and electronic engineers; interesting and varied work on industrial application of measurement techniques; vacancies exist for experienced staff in research department of West London engineers.—Please forward full details of age, education, qualifications, experience and salary required, to Box A.207, Central News, Ltd., 17, Moorgate, London, E.C.2. [9119

WANTED, radio mechanics (Surrey) for the overhaul and maintenance of aircraft radio and radar equipment in well-equipped workshops, applicants should be able to carry out aircraft installations, and have had previous experience in work of this nature; rate of pay according to experience and ability; full details to—Box 3398. [9272

SENIOR draughtsmen required for checking in in large engineering company situated in the East London area; applicants should have had previous experience of electronic equipment, good salaries and staff conditions, pension scheme in operation.—Please write, giving details of experience, to Box 3110, quoting Reference L. 80. [9215

RADAR mechanics required for Field Trials Division; applications are invited from ex-R.A.F. or R.E.M.E. personnel who have obtained the rank of N.C.O., fitters, preferably Servicemen or Flight Sergeants; vacancies offer good opportunities and excellent conditions, including superannuation scheme.—Apply to Personnel Department, E.M.I. Engineering Development, Ltd., Hayes, Middx., quoting ED/95. [9505

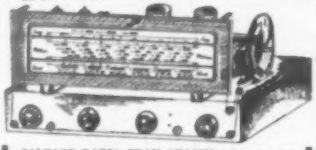
SENIOR electro-mechanical engineer required by new division of prominent engineering establishment in Northern Ireland to lead section engaged in development work on guided weapons; degree or equivalent in electrical or mechanical engineering, with good practical experience in design of small precision electro-mechanical devices, servo systems or instruments; good salary and prospects for man with originality. Assistance given with housing; send full particulars of age, qualifications and experience to—Box 3249 [9248

DUKE & CO.,

TYPE 26 1196 S'HET RECEIVERS. Price 7/9 each. A real bargain. For t.w.o.v.e.r. reception. Converts easily to battery or mains receiver. Free drawing supplied for mains conversion. Valves and some parts removed, but the following remain: 4 tuning c.nds., 32 fixed conds., 29 resistances, trans., switches, v.controls, v.holders. Ideal new chassis and all usual parts. Post 2/-.

TRANSFORMERS. Bargain salvage offer of Mains transformers. New, resprayed, guaranteed for three months. Pri. 0-240, tapped 210, 115 v., Sec. 260-0-260, 80 m/a., 6.3 v., 3 a., 12/9. Post 2/-. Also O.P. transformers. Salvage. Unused. Clearance price of 2/9. Post 1/3.

EXTENSION SPEAKERS. New type 3in. speaker 15 P.M. in baffle stand with gold sprayed metal fret, 5ft. lead connected. Ready for immediate use. 19/9. Post 1/9.



SALVAGE RADIO GRAM CHASSIS. 5 valve, all wave, 1952 superhet. Guaranteed in complete working order. End drive models £7 17/6; front drive £9 17/6. Includes everything except speaker. Post 4/6.

AUTO CHANGE GRAM UNITS. By famous manufacturer. Now slashed prices on our models (salvage). Single speed now £5 19/6; three speed £8 19/6. Prices do not include pick-up heads. Carriage 5/-.

MINIATURE MOVING COIL 'PHONE SPEAKER. Ex-headphone, 40 ohms impedance, ideal quality microphone, reduced to 2/9 to clear.

CONDENSERS. High purchase of salvage stocks makes it possible for us to reduce prices again. Single and two gang, 0.0005 mfd. All perfect condition, 2/9 each. Post 6d. Two gangs available in standard and half sizes.

C.W.O. or C.O.D. Money back guarantee. Send stamp for copy of our 1951 catalogue.

DUKE & CO.,
621 Romford Road, London, E.12
GRA 6677

FOR ACOUSTIC RESEARCH

Pulse and Square-wave Generators. Pulse width 0.25 to 120 milliseconds. Single or repetitive pulses with provision for square-wave output with external excitation.

Now in use for Medical Research.

Details on request.

DUN (electronics) & CO.,
17 Victoria Gardens, London, W.11. *Park 6636*

Science brings a new high standard in tubing. Polythene is completely unaffected by acids, unbreakable, and with its glass-smooth bore so easy to clean. It is versatile and resistant to corrosion and ideal for tank linings, buckets, valves, etc. Let our technical representative call and discuss how Polythene can contribute invaluable aid to you.

TENAPLAS
(SALES) LIMITED
Southern Sales and Export: **24/26 MANCHESTER SQUARE, LONDON, W.1.** Tel: Welbeck 7941

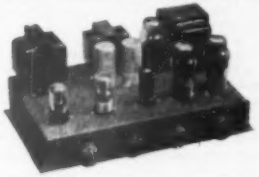
Something completely

NEW

in High-Fidelity

AMPLIFIERS

Any good amplifier can produce the most disappointing results if the input circuit is not correctly matched to the radio or gramophone unit feeding it. Most amplifiers are made *without any knowledge of the other equipment to be used with them* and the input circuit, therefore, is a compromise which may or may not result in a satisfactory performance. The Nusound 8½ watt is not a mass-produced product of this kind. The basic circuitry is identical in all models *but the input circuit is designed to individual requirements*. The customer tells us which pick up or feeder units are to be used (our own or any other good make) and the amplifier is supplied to ensure the very best results possible *from the combination*.



Nusound 8½ watt Quality Amplifier PP 6V6—independent Bass and Treble boost and cut—neg. Feedback—provision for Radio Feeder Unit—Freq. response 25 to 20,000 c.p.s. ± 1 DB—hum 80 DB down at 6.5 watts—Feedback 14 DB. Price only £15/17/6, also available with Remote Control Unit, Price £17/10/-.

. . . and something completely

NEW

In High-Fidelity

FEEDERS

It is generally conceded that the V.H.F. broadcasts from the B.B.C.'s Wrotham transmitter provide the highest quality of sound available to the listener to-day. Here is a Nusound feeder unit designed specifically to take advantage of this fine source of entertainment. This unit, with its output of 250 mV., together with A Quality Amplifier offers a performance to delight the most discriminating ear. Price £7/19/6.

NUSOUND PRODUCTS LTD.

(Dept. W. 11) WARDOUR ST., LONDON, W.1.

Tel: GERrard 8845

COVENTRY RADIO

Component specialists since 1925

10,000

Radio Valves in stock, all types. Immediate delivery at current list prices. Full range of 1st Grade makes of components—Note we do NOT stock surplus, only new goods.

New list available shortly.

COVENTRY RADIO

189, Dunstable Road, Luton.

SITUATIONS VACANT

WRITER or technical journalist in London, experienced writing data sheets handbooks publicity offered occasional evening work by electronic instrument makers.—Box 3526. [9262

DEVELOPMENT engineer (electronics) required by company concerned in the manufacture of radio communications equipment, London area; practical experience with low power radio transmitters essential; ample scope for advancement.—Applications, giving full details of age, experience and salary required, to Box 3109. [9214

FERRANTI, Ltd., have vacancies for men of suitable qualifications, experience and interest on work connected with electro-mechanical gunnery predictors, gyroscopic instruments and allied equipment; academic qualifications desirable though less important than natural aptitude and practical ability in light mechanical or electrical engineering. SALARY according to age and experience, in the range of £350–£650 per annum. PERMANENT staff appointments with pension benefits. FORMS of application from Mr. R. J. Hebbert, Staff Manager, Ferranti, Ltd., Hollinwood, Lancs. PLEASE quote reference HGN X. [9322

MECHANICAL engineers required for aero engine vibration investigations; previous experience desirable but not essential; must have knowledge of electronics; applicants should be graduates or at least hold the Higher National Certificate in Engineering.—Write, stating age, experience and salary required, to the Labour Manager, Rolls-Royce, Ltd., Derby. [9164

TECHNICAL Sales Engineer, not under 28, with sound knowledge of electrical and electronic instruments, mainly in the audio frequency range, with ability to service them if required; prepared to travel to any part of the country at any time; degree qualification preferred; apply in writing, stating age, experience, qualifications and salary required to—Box 5157. [9232

SENIOR engineer required to be responsible for the development of electronic control systems and associated test apparatus; candidates should be suitably qualified and preferably have experience of airborne equipment; applications will be treated in strict confidence.—Please reply, stating age, qualifications and experience and quoting reference M.43, to Box No. 3364, c/o W.W. [9268

RADIO service technician required by motor distributors, thorough technical knowledge of radio and servicing experience essential, personality and appearance important; successful applicant will be responsible for developing the department and its contact with traders and private customers; salary and commission.—Apply Westgate Motor House Co., Ltd., Gloucester. [9316

WANTED.—Transmitter maintenance engineer by Near East Arab broadcasting station, Limassol, Cyprus; experience of high power medium- and short-wave transmitters must be capable of taking sole charge; age 30–45; write stating age, technical training and experience; salary £C1,050 with discretionary increase £C50 to £C1,250, with taxable cost of living addition.—Box 3050. [9208

£1600—£2,000 p.a., salary according to qualifications and experience; progressive company requires chief engineer with honours degree backed by considerable experience in controlling electronic design and development laboratories and model shops; knowledge of high grade mechanical movements and production methods essential; apply in strictest confidence giving full details to—Box 3444.

ENGINEERS and technical assistants required for test and development work in connection with flight simulators; experience in one or all of the following fields, regulated power supplies, amplifiers, servo mechanisms, an own initiative a distinct advantage.—Applicants should write, stating experience and qualifications, to the Personnel Officer, Air Trainers, Ltd., Bicester Rd., Aylesbury, Bucks. [9216

EXPERIENCED electronic development engineers, 25 to 35 years of age, required immediately to assist in expanding activities of company in N.W. London area, sound knowledge of television or magnetic recording specially sought, but candidates should be capable of approaching any potential field; only loyal men of good mettle will be considered; salary according to qualifications and experience.—Box 3521. [9325

MULLARD EQUIPMENT, Ltd., Wandsworth, have vacancies in their product engineering dept. for senior electronic engineers. Applicants should preferably have recognised qualifications and have had experience in the design of electronic equipment (transmitters, receivers, instruments, etc.); permanent pensionable posts. Salary according to experience and qualifications. Apply Personnel Dept., M.E.L., 91-95, Garratt Lane, S.W.18. [9222

MURPHY RADIO have vacancies in their electronics division for a first-class senior design draughtsman and a senior mechanical designer; applicants should be up to at least National Certificate standard and have had experience in design of electronic equipment, small mechanisms or similar work and must be capable of working on their own initiative; employment is permanent and pensionable and offers excellent opportunity of broadening experience in this interesting field of work; full details of experience and qualifications should be included in applications which may be forwarded in confidence to—Personnel Manager, Murphy Radio, Limited, Welwyn Garden City. [9275

H. FRANKS,

58, NEW OXFORD STREET, LONDON, W.C.1

PHONE: MUSEUM 9394

One minute from Tottenham Court Road Stn.

COLD CATHODE RELAY UNITS fitted two S.T.C. Cold cathode tubes No. G240/2D, two Siemens High Speed Relays 1700/1700 ohms, size of unit approx. 6 x 7 x 4ins. Price £3/2/6 each.

ELLIOTT MAGNETIC RELAYS TYPE H, Coil res. = 100 ohms. Operating current, low contact 238 microamps, high contact 378 microamps, totally enclosed in metal case 9 x 4½ x 4ins. £4 each.

600 WATT STEP-DOWN TRANSFORMERS, Input 200/250 v.a.c. Outputs 100v 4 amps, 12/14v, 10 amps, 32v, 5 amps. £4 each. Carr. 10/-.

STEP-DOWN, input 200/250 volts, 50 cycles, Output-tapped, 8, 16, 24, 32 volts, 15 amps. Price £3/7/6 each. Carr. paid.

STEP-DOWN TRANSFORMERS, input 230 volts A.C., 50 cys. Output 12 volts, 8 amps. Price 28/- each. Post paid.

'STANCOR' U.S.A. 2.5 K.V.A. AUTO-TRANSFORMERS. Input 115/250 volts, 50/60 cys. Output 110 volts. Fully shrouded. Size 11 x 8 x 7ins. £10/10/0 each.

WESTINGHOUSE RECTIFIER SETS. Style 288 G.P.O. Input 200/250 volts A.C., 50 cycles, output 50 volts D.C. 1½ amps. £3/10/- each. Carriage 10/-.

LONDEX RELAYS. type 220 Ref No. 10F/494, two heavy break contacts, 24 volts, fitted in metal cases 4 x 4 x 2¼in., 8/6 each.

ADMIRALTY PATTERN. Heavy duty L.T. transformers, Primary 230 volts A.C., 50 cycles 9 amps. Secondary 18 volts centre tapped 108 amps. Price £15 each. Carr. 20/-.

SANGAMO MOTOR UNITS, Model 7, final speed one rev. 24 hours, 200/250v. A.C., 50 cycles. Price 27/6 each.

SANGAMO MOTOR UNITS, Model 7, final speed one revolution per seven days, 200/250v. A.C. 50 cycles. Price 30/- each.

'KENTS' 24V. D.C. SHUNT-WOUND MOTORS. 3,500 r.p.m. 1/20th h.p. Double ended spindle, fully enclosed. 27/6 each.

2 ENGLISH ELECTRIC IGNITION TESTERS, ex Air Min. Ref No. 5G/417 Model U.E.D. Takes supply of vehicle under test of 6/12/24V. D.C. or 230V. A.C. mains supply. Price each, less Harness £23/10/-. Carr. paid.

STAINLESS STEEL AERIAL WIRE, Gauge 7/015 in 1400 foot reel. Price 40/- per reel.

RECEIVER OUTPUT LIMITERS Type No. 1 Ref. 10A/10520, fitted 4 pencil rectifiers, switch, phone jack and plug, in metal case size 3¼ x 4¼ x 1½. Price 14/- each, post paid.

U.S. ARMY TYPE BD/71 TELEPHONE SWITCHBOARDS, 6 line connection, fitted in case 18 x 10 x 14ins. Price £6/10/- each.

MINIATURE IMPULSE MOTORS made by "Gents," size 3 x 2 x 1¼in. Suitable for operating models, switches, etc. Operates on 4/6 volts A.C. D.C. and is very powerful for its size. Price 8/6 each. Post paid.

SANTON SWITCH-BOXES type E. Ref. Sc/2468. Fitted three Santon switches and fuse box. All housed in one unit, size approx. 14 x 10 x 3in. Price 22/6 each.

TURNBULL ELEC. CO. U.S.A., MULTI-BREAKER SWITCHES, 115/230V. A.C. 70/100 amp. Max. fitted in metal cases 13 x 9½ x 3¾in. Packed in original cartons. Price 27/6 each. Carr. paid.

SEIZIUM SELENIUM RECTIFIERS. 250V. 120 ma. Price 9/- each.

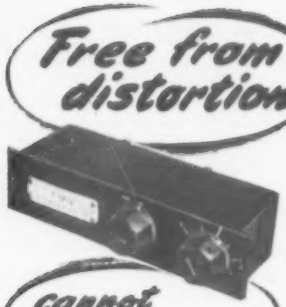
Apply for full Mailing Lists. Price 6d. each.

We have a large selection of SELSYN Controls, MAGSLIPS, HUNTER magslips, SELSYN transmitters of various types. We invite enquiries for any of the above types.

10,000 G.P.O. type 3,000 and 600 relays, assorted contacts and coils. Siemens High Speed Relays, Uniselectors, Telephone Keys, Handsets, etc.

Special Quotations for Quantities.

An assortment of various Ex-W.D. Radar and Radio Equipment, Relays, Power Packs, Oscilliograph Units, Gears, Photographic Apparatus, available to callers only.



E.M.G.

STEEP-CUTTING INFINITELY VARIABLE FILTER

No other filter combines all the advantages of this model which are, briefly, to cut response above any desired level between 4,000 and 8,000 c.p.s. at an average steepness of 30 db. per octave, easy fixing (connects between 15 ohm speaker and amplifier output), robust construction, no distortion or appreciable loss of volume. Recommended for reducing surface noise on '78' records, cutting 'edge' on some L.P. records, and eliminating high-pitched interference on radio. Price £4 10 0. Leaflet on request.

E.M.G. HANDMADE GRAMOPHONES, LTD
6, Newman St., Oxford St., W.1
Telephone: Museum 9971-2-3

SAMSONS SURPLUS STORES

S.T.C. FIELD HAND TELEPHONE SET. Complete Unit built in metal Container which can be easily held in one hand, operates from 4½ volt 9d. battery. Buzzer calling device, will work efficiently up to 12 miles, on twin cable or 10 miles earth return. Suitable for Offices, Farms, Building sites, Estates, etc. 65/- each instrument. P.p. 3/-.

TELEPHONE CABLE D.3 SINGLE. 1 mile drums 55/-. Carr. 5/-.

B.C. 610 TUNING DRAWERS. Oscillator and Doubler. Freq. 3.5-6.6 mcs. or 6.35-8.0 mcs. Brand new 25/-. p.p. 2/-.

U.S. ARMY INTERPHONE AMPLIFIER type B.C.3447C complete with 6P8 valve, 10/-. p.p. 1/6.

U.S.A. MANUFACTURE HEAVY DUTY AUTO TRANSFORMERS. Tapped 115, 150, 200, 220, 250 volts, very conservatively rated at 2½ K.V.A. We rate them at well over 3 K.V.A., **£10 0 0.** Callers only, please, too heavy for despatch. Also available large selection of Auto-transformers of various ratings, write for particulars.

HEAVY DUTY SLIDING RESISTORS 50 ohm Tapered. 2.5 to 1 amp. Geared drive, 45/-. p.p. 2/6. 6.8 ohm, 25 amp. **17 6.** p.p. 1/6. 10 ohm 5 amp **12 6.** p.p. 1/6. 1 ohm, 12 amp **12 6.** p.p. 1/6. 8 ohm 5 amp **17 6.** p.p. 1/6. 50 ohm 1 amp. **10 6.** p.p. 1/6.

149/171 Edgware Road
London, W.2. Tel. PAD. 7851
125 Tottenham Court Road, W.1
Tel. EUS. 4982

All orders and enquiries to our Edgware Road branch, please. Open all day Saturday at the Edgware Road branch.

SITUATIONS VACANT

ELECTRONIC engineer with technical and assembly experience required for factory engaged in medical work.
PARTICULARS with experience, salary required to:—
E.M.S., 209b, Great Portland St., London, W.1. [9506

BELLING & LEE, Ltd., Cambridge Arterial Rd., Enfield, Middlesex, have vacancies for electronic designs engineers in the sales department; duties are liaison with Government and industrial laboratories, and radio and television designs engineers; ownership of car essential; compulsory contributory pension scheme; remuneration is salary, commission and expenses. APPLICATIONS to Secretary (in confidence) qualifications and experience. [9229

SENIOR estimator required by the components division of a large East London radio company; applicants must be capable of checking and building up detailed estimates on all components and coil-winding products; previous experience and ability to control personnel essential; excellent prospects; a company pension scheme in operation.—Please write, in confidence, giving details of experience to Box 5435, quoting reference No. M.64. [9279

FIELD Trials.—The General Electric Co., Ltd., require engineers at the Stanmore Laboratories concerned with (a) the assessment of field trials of electronic equipment and (b) the organization of and participation in these trials (for this vacancy, some travelling in involved); experience in similar work would be an advantage.—Write to the Staff Manager (Ref. GBLC 8-555), G.E.C. Research Laboratories, Wembley, Middlesex, stating age and record. [9255

DEVELOPMENT engineers, International Aeradio, Ltd., specialists in equipment design for aviation service, due to expansion of development section at Bovingdon Airport near Watford, require junior and senior radio and telegraph engineers. Salary according to experience; single quarters provided, pension scheme 5-day week, canteen facilities.—Please apply through Local Labour Exchange to Personnel Officer, 40, Park St., London, W.1. [0255

McMICHAEL RADIO, Ltd., require senior and junior engineers in their equipment division development laboratory at Slough. Training and experience in the field of applied electronics (including communications) and experience of working with Government departments are the chief qualifications required.—Write, stating age and full details of training, qualifications and experience, to the Chief Engineer, Equipment Division, McMichael Radio, Ltd., Slough, Bucks. [9174

BELLING & LEE, Ltd., Cambridge Arterial Rd., Enfield, Middlesex, require research assistants in connection with work on electronic components, fuses, interference suppressors and television aerials; applicants must be graduates of the I.E.E., or possess equivalent qualifications together with similar laboratory experience; salary will be commensurate with previous experience; 5-day week, contributory pension scheme.—Applications must be detailed and concise, and will be treated as confidential. [0250

THE ENGLISH ELECTRIC VALVE Co., Ltd., Chelmsford, Essex, has several attractive vacancies, junior and senior, for physics and engineering graduates to undertake research and development work on vacuum tubes; applications from graduates who have recently qualified as well as those with the industrial and research experience will be considered; please write, giving full details, and quoting ref. 415P, to Central Personnel Services, English Electric Co., Ltd., 24-30, Gillingham St., London, S.W.1. [9117

ELECTRICAL inspectors and testers required for work of national importance on radio type telephone equipment; men 21 to 45 years of age who are radio amateurs or have radio inspection experience or those who have received training in radar in Her Majesty's Forces during recent service will be considered; minimum commencing wage £7 per week (hour 5-day week (starting hour 7.15 a.m.).—Apply personally after 9 a.m. or by letter to Personnel Manager, Standard Telephones & Cables, Ltd., North Woolwich, E.16. [9263

MINISTRY OF CIVIL AVIATION.—Radio mechanics required at aerodromes and radio stations in various parts of United Kingdom; special training courses for keen mechanics with basic qualifications; interesting work in progress providing electronic aids to navigation; prospect of permanent pensionable posts; rates of pay (London) from 109/- per week at age 19 to 143/- at 25, and rise, subject to qualifying test to 173/- plus pay addition of 10%; candidates aged 19 or over with practical experience in maintenance of radio or radar equipment should apply to any Employment Exchange, quoting Order No. Kings Cross 576. [9236

EXPERIENCED component engineers are urgently required by a large Midland firm for work of national importance. Applicants selected will be required to build up a new section specialising in selection and design of electrical and mechanical components for electronic equipment, together with associated light and medium heavy control gear, transformers and wiring. Applicants should have a full working knowledge of service specifications and type approval procedure, experience of component design and an understanding of ratings.—Please write, giving full details of experience and qualifications, and quoting reference IHF to Box 5138. [9228

G.L. AMPLIFIERS

Gramophone & Public Address
High Quality Push Pull Output Valves
STEEL CASE INSTRUMENTS

PP.12. Concert Gramophone Amplifier ..... **10 gns.**
PP.14. As above, with extra tone stage ..... **12 gns.**
PP.15. Mic and Gram, small P.A. 12 watts ..... **12 gns.**
PP.18. As above with mixer and tone stage ..... **14 gns.**
"The Social" Leathercloth suitcase style 15 watt amplifier for mic and gram, fitted with heavy duty speaker ..... **20 gns.**
Recommended microphones for any of above ..... **6 gns.**

THIS MONTH'S SPECIAL OFFER
The **"G.L. Audiogram"** Leathercloth suitcase style 4 watt amplifier, heavy duty speaker, fitted unit with magnetic pick-up and turntable. For personal, school, or concert use **£22**

The "G.L." Range of audio instruments covers all likely requirements of sound amplification. Record-players, changers, pick-ups, speakers, mics., etc.
Catalogues, 3d.

G.L. ELECTRONICS,
16 Pattison Road, London, S.E.18.
Woolwich 0387

U.S. WAR SURPLUS WANTED

APR-4, APR-5, APR-1, ARC-3, etc.; TS-12 13, 34, 35, 36, 45, 120, 146, 155, 173, 174, 175, 323 and other "TS-" units, etc., particularly for the MICROWAVE REGION; also U.S. commercial laboratory equipment General Radio, Ferris, etc.); special tubes, such as 723A/B, 3C22, etc.; spare parts, technical manuals: single units or large quantities.

Sell direct to us, receive the full top price. Describe and price to:

ENGINEERING ASSOCIATES
434 Patterson Road
Dayton 9, Ohio, U.S.A.

G.E.C. GERMANIUM CRYSTAL DIODES

Midget Size, 5/16in. x 3/16in.
Wire Ends for Easy Fixing.
4/6 each, postage 2½d.
Technical Details and Selected Types available.

B.T.H. GERMANIUM CRYSTAL DIODES

Moulded in thermo-setting plastic.
4/6 each, postage 2½d.

SILICON DIODES, 3/6. Postage 2½d
Fixing Brackets, 3d. pair.

COPPER INSTRUMENT WIRE
ENAMELLED, TINNED, LITZ.
COTTON and SILK COVERED
Most gauges available.
B.A. SCREWS, NUTS, WASHERS
soldering tags, eyelets and rivets.
EBONITE AND BAKELITE PANELS.
TUFNOL ROD, PAXOLIN TYPE COIL FORMERS AND TUBES, ALL DIAMETERS.
ERIE AND DUBILIER RESISTORS.
Latest Radio Publications.
SEND STAMP FOR LIST. TRADE SUPPLIED

POST RADIO SUPPLIES
33 Bourne Gardens, London, E.4

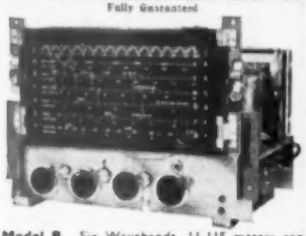
DIRECT FROM THE MANUFACTURER

Dulci Radio Radiogram Chassis

A/C 100-120 & 200-250 VOLTS.

OUTSTANDING VALUE OF NEW PRODUCTION!

Fully Guaranteed



Model B. Six Wavebands, 11-115 metres continuous in 5 ranges (4 BANDSPREAD) and MW 185-550 m. Six position Tone Switch (3 radio-3 gram.). Price Tax Paid **£15/15/0**

Model B3. Three Wavebands, Long, Medium, Short. Gram. switching on W/Change switch. 3 position Tone. Price Tax Paid **£12/12/0**

Both chassis 11½in. x 7in. x 8½in. high. Latest type valves : 6BE6, 6BA6, 6AT6, 6BW6, 6X4. Flywheel tuning Negative Feedback over entire audio section. Engraved knobs.

BUILT TO HIGHEST PERFORMANCE STANDARD and SPECIFICATION

Cabinet Escutcheon for 9in. x 5in. dial for 4/9 extra. Chassis despatched under Money-Back Guarantee conditions on receipt of remittance.

Further particulars from :

THE DULCI CO. LTD.,
97 VILLIERS Rd., LONDON N.W.2
Tele: Willesden 7778

THIS IS REOSOUND BUILT TRADE MARK

DE LUXE INSTRUMENT CASE

12in. x 8in. x 5in. in 18G. Steel with Radiused Top Corners, Louvred Back and fitted with Chromium Plated Handle, and four P.V.C. feet. Finished in Black, Grey, or Brown Wrinkle Enamel. 18G. Steel front panel, **£1/11/6.**

With front panel in 16G. Aluminium, **£1/13/-.**

Small steel chassis with angle brackets to fit Black **6/9**
Ditto, in 16G. Aluminium, self-colour.. **9/9**

Postage and Packing extra.

Illustrated Lists on request.

All List Prices now plus 50%.

REOSOUND ENGINEERING & ELECTRICAL COMPANY, "Reosound Works," Coleshill Road, Sutton Coldfield.

Grams : Reosound, Sutton Coldfield. Tel. SUT. 4685.

SITUATIONS VACANT

ASSISTANTS required in test room for the adjustment of precision electrical apparatus.—Apply in writing to H. Tinsley & Co., Ltd., Werndee Hall, Stanger Rd., S. Norwood, S.E.25. 19219

TELEVISION Service.—Required immediately, first-class working Service Manager, fully experienced in TV fault-finding, only those with the necessary ability and experience need apply; wages £12 per week; unfurnished flat available if required.—Full particulars to Victor Freed, Ltd., 6, Duke St., Cardiff. 19224

THE GENERAL ELECTRIC Co., Ltd., Research Laboratories, Wembley, Middlesex, have vacancies for graduate engineers and physicists for electronic research and development work in the microwave field. Openings are concerned with (a) receivers, (b) aerials, (c) the development of specialised test equipment for airborne radar. An original approach is necessary and a knowledge of microwave techniques or circuit design is essential. Appointments will be at Stanmore (Middx). Apply to the Staff Manager (Ref. GBLC/S/915), stating age, qualifications and experience.

GRADUATE physicists and engineers are required at the G.E.C. Stanmore Laboratories for work concerned with (a) electronic circuitry, (b) electronic simulators, (c) magnetic amplifiers or small power electric motors, and (d) I.F. receivers. Experience in one of these fields will be an advantage. Apply to the Staff Manager (Ref. GBLC/S/916). Research Laboratories of The General Electric Co., Ltd., Wembley, Middlesex, stating age, qualifications and experience.

ELECTRICAL and Mechanical Engineers with an interest in servo systems and small mechanical devices are required by the Research Laboratories of The General Electric Co., Ltd., Wembley, Middlesex, for work at Stanmore. University degree or H.N.C. is essential, plus some experience in the development of small mechanisms.—Write to the Staff Manager (Ref. GBLC/S/917), stating age and record.

ELECTRICAL engineer or physicist with higher national certificate or equivalent is required for the design of small quantities of special transformers for experimental apparatus. The appointment is at Stanmore. Apply to the Staff Manager (Ref. GBLC/S/918), Research Laboratories of The General Electric Co., Ltd., Wembley, Middlesex, stating age, qualifications and experience.

DEVELOPMENT engineer or physicist is required for work concerned with transistor and cold cathode valve circuitry. Degree or H.N.C. in electrical engineering or physics with electronics or telecommunications is essential. Previous experience would be useful. Appointment is at Stanmore. Apply to the Staff Manager (Ref. GBLC/S/919), Research Laboratories of The General Electric Co., Ltd., Wembley, Middlesex, stating age, qualifications and experience.

SENIOR Physicist or Engineer with wide experience in radio communications and radar, is required to direct a research team in these fields. Familiarity with centimetric measuring techniques, circuitry, aerials and propagation is essential, together with a real knowledge of the fundamental aspects of such work. This is an appointment at Stanmore (Middx) for a first-class research man and carries an attractive salary commensurate with experience, and excellent prospects. Applications should be sent to the Staff Manager (Ref. GBLC/S/920), The Research Laboratories of The General Electric Co., Ltd., Wembley, Middlesex, and should give full details of age, qualifications and experience.

EXPERIENCED component engineers are urgently required by the English Electric Co. for work of national importance. Applicants selected will be required to build up a new section specializing in selection and design of electrical and mechanical components for electronic equipment, together with associated light and medium-heavy control gear, transformers and wiring. Applicants should have a full working knowledge of service specifications and type approval procedure, experience of component design and an understanding of ratings.—Please write giving full details of experience and qualifications and quoting Ref. 986D, to Central Personnel Services, English Electric Co., Ltd., Marconi House, 336/7, Strand, London, W.C.2. 19221

MINISTRY of Supply require senior experimental officer at Trials Wing Outstation, Aberporth, South Wales: duties mainly concerned with control of operation and maintenance of electronic instruments and supervision of technical work; min. qual. H.S.C. (science) but H.N.C. or degree elec. eng. may be an advantage; experience with radio or radar equipment preferably used for measurement of physical qualities desirable; liking for field work essential; salary within range £803—£1,053 (min age 35); female somewhat lower; post unestablished; forms from Technical Branch, M.O.L.N.S., Technical and Scientific Register (K), Almack House, 26, King St., London, S.W.1, quoting D.401/52A. Closing date December 9, 1952. 19250

THE English Electric Co., Ltd., Luton, invites applications for permanent posts in a laboratory engaged in development work involving radar techniques: senior and junior positions are available for candidates possessing suitable qualifications and a knowledge of one or more of the following: (1) Centimetric systems and measurements. (2) radar or television receiver practice. (3) mechanical layout and design work in connection with the above; salaries according to qualifications and experience from £450 upwards; the laboratories are new and pleasantly situated; the company also encourages further study in the case of juniors.—Please reply, quoting ref. 815G, to Central Personnel Services, English Electric Co., Ltd., 356 Strand, London, W.C.2. 19245

ALEC Davis SUPPLIES Ltd

DEPT. P.W.
18 TOTTENHAM CT. RD.
LONDON, W.1.

MUSeum 4539/2453

Ronette Microphone. The latest Ronette XTAL mike, R110. Freq. 30-7,500 cps. Only **52/-.**

A.D.S. HI. FIDELITY AMPLIFIER. This is our latest gramophone amplifier which you **MUST** hear. P.P. 6V6 output. Freq. 25—18,000 cps. + —1db Hum —60db at 6½ watts. Treble boost and cut—Bass boost—L.P. correction. Provision for Feeder Unit. Max. UNDISTORTED OUTPUT 8½ watts. Price **£15.** Send s.A.E. for leaflet.

SPECIAL.—HIGH QUALITY 4½-watt AMPLIFIERS. Separate treble and bass lift. In black crackled case, **£9/17/6,** plus 5/-.

GRAMOPHONE EQUIPMENT. B.S.R., 33⅓—78 R.P.M. Motor Unit, **78/7,** plus 1/6. B.S.R., 3-speed Motor unit, **£6/6/6,** plus 1/6. Collaro 3-speed Unit, XTAL Heads, **£14/9/6.** RC800—78 r.p.m. Changer, **£12/3/3.** Collaro 2 RC511, 3 speed, XTAL, Heads, **£18/16/-.**

DECCA XMS P/UP, **£7,** plus 1/-. Connoisseur STD P/UP, **£4/11/6,** plus 1/-. S/Light weight, one head, **£6/9/-.** LP head, **71/6.** Trans., **15/-.** Fibre P/UP, **£4/3/2.** Trans., **35/-.**

SPECIAL OFFER.—CHANCERY XTL P/UP, complete with L.P. and 78 inserts. **50/6,** plus 2/- postage.

GARRARD HEADS.—Hi-Fi, **50/11.** Miniature, **54/4.** Standard, **26/6,** plus 1/- post. Adapter Type A, **9/3.** B, **6/7.** C, **4/6,** plus 1/- post.

COLLARO A.C. D.C. MOTOR, 12in. Table, **£10/6/11,** plus 2/6. Garrard AC8 Speed Controlled 78 RPM 12in. Table, **£5/10/-,** plus 2/6.

NEW GARRARD 3-SPEED AUTO RC75. Changer-over Heads. Crystal or magnetic, **£16/18/9,** plus 5/- post.

COLLARO AC214 Player Unit MAG Head, **69/10/5,** plus 2/-.

M200 WEARITE IPS, 21/-, plus 1/-. 9in. Elac. Speaker, 15/-, plus 1/-. Miniature O/P Trans, 4/-. Min. ¼ mer. Pot. OP sw., 5/-.

METAL RECTIFIERS, R.M.2, 125 v., 110 mA, **5/9.** R.M.1, 125 v. 60 mA, 5/-, plus 1/-. Type 280 STC, 280-v. 80 mA, **10/-.**

DENCO "C" T.R.F. COILS. Medium and Long wave, **8/-** pair, plus 1/-.

4SPEAKERS.—3in. ELAC, **15/-.** 5in. ELAC, **15/-.** 5in. ROLA, **19/6.** 10in. Goodman, **27/6.** 12in. Truvox, 3Ω, **50/6,** plus 1/3 postage. All Tax Free.

BRANDENBURG E.H.T. UNIT.—6.3 kV., 6 cms. Coil only **26/-.** Unit with U22 Rectifier, **69/6.**

10/15 K.V. COILS, 35/-.

QUALTAPE NEW PRINCIPLE 3-SPEED RECORDER now available. **16** gns., plus 2/6.

MOTEK 1 MOTOR TAPE DECK. High impedance heads. A first-grade instrument. **13** gns., plus 2/6. **MOTEK RECORD AND ERASE HEADS, 30/6** each plus 1/-.

MOTEK OSC. COILS, 12/6.

COLLARO TAPE DECK MIXTURE. Left- and right-hand drive, **18/6** each, plus 1/6.

SCOTCH BOY. EMI-OEC Tape, **35/-,** plus 6d. **REXINE PLAYER CASE.** Cut for B&R Motor, **39/6,** plus 3/6.

EMI 20w. PUBLIC ADDRESS AMPLIFIER. KT66 Output, Rack Mounting, all Valves Metered, Brand New. **£25.** A few only.

TRANSFORMERS. 6.3 v., 1.5 a., **7/6,** plus 9d. 4 v. 2 a., **7/6,** plus 9d. 12 v. 1 a., **6/6,** plus 9d. 6.3 v. 6 a., **10/6,** plus 1/6. Williamson Output, **£4/10/-.** Choke, **27/9,** plus 1/-.

CHOKES. 10 h. 150 mA, **16/3,** plus 1/3. CH5, 10 h. 60 mA, 500Ω, **4/9,** plus 1/-. CH4, 10 h. 75 mA, 150Ω, **4/9,** plus 1/-. 30 h. 30 mA, 1,500 Ω, **6/6,** plus 1/-. 50 h. 20 mA, 1,100 Ω, **6/6,** plus 1/-. 30 h. 20 mA, **6/6,** plus 1/-. 20 h. 15 mA, **5/6,** plus 1/-.

FULL MAIL ORDER FACILITIES

(Please Add Postage)

Shop Hours, Monday to Friday, 9—5.30 p.m., Saturday, 1 p.m.

THE HAYES COMPANY

RADIOGRAM CHASSIS

● **9 VALVE CHASSIS MODEL RG 200**
High quality 8-watt push-pull output. Separate LF and HF units. Bass and treble boost controls. 3 wavebands. **£27 10 -.**

● **7 VALVE CHASSIS MODEL RG 135**
Push-pull output 6 watts. Negative feedback. Special tone control circuit. 3 wavebands. **£19 10 -.** (Also available for universal mains.)

● **5 VALVE CHASSIS MODEL RG 120**
4-watt output. 3 wavebands. New type dial. Negative feedback. **£15 10 -**

Fully illustrated details of all chassis gladly sent by return post. Kindly note new address for both Sales and Service.

LUTHER STREET, BRIGHTON, 7.
'Phone—Brighton 21467

Rebuilt Standardised
TEST METERS
THE ELECTRICAL INSTRUMENT REPAIR SERVICE
329 Kilburn Lane, LONDON, W.9. *Tel.* LAD 4168

ANOTHER OF BROOKES FAMOUS CRYSTALS

TYPE "SM"
Range 3 to 17 mc/s.
Hermetically sealed metal can 1.125" high under pins, 0.825" wide, 0.457" thick, with 3/32" diameter pins at 0.490" centres.

BROOKES CRYSTALS LTD.
19, Stockwell St., Greenwich, London, S.E.10.
Phone: GREenwich 1828 Cables: Xtals London Grams: Xtals Green London

THE REPAIRERS of ELECTRICAL INSTRUMENTS

All kinds of Meters, Volt, Amp., Galvo.; Recording Electric Clocks; Aircraft Instruments repaired. We are also skilled Horologists.
Government Ministry enquiries invited.

Ask for Estimate. Send your enquiries to
Mr. J. R. W. Ridgway, F.B.H.I.
J. R. RIDGWAY & CO.
341 City Rd., E.C.1. Phone: TERminus 0841

SITUATIONS VACANT

AN experienced draughtsman is required in the expanding valve development section of the Nelson Research Laboratories of the English Electric Co., Ltd., Stafford. Applicants should have Inter B.Sc. or Higher School Certificate and experience in mercury vapour and high vacuum tubes is desirable but not essential.—Write full details, quoting reference 1458 to Central Personnel Services, the English Electric Co., Ltd., Marconi House, 336/7, The Strand, London, W.C.2. [9220

RADIO (Meteorological) Mechanics required by Meteorological Office. Qualifications.—Basic knowledge of radio and radar and experience in maintenance/operation of radar equipment including oscilloscopes. Successful applicants serve in U.K. and overseas. Commencing London wage £7/17/6 at age 25 or over, rising annually to £9/10/6; deduction of 5/- for each year below 25; overtime, night duty allowances, etc.; promotion prospects.—Apply to Borough Employment Exchange (Dept. WW), 256, Wandsworth Rd., London, S.E.17. [9041

SERVICE engineers (2) required by leading cinema sound equipment company for duties in Bedford and London and surrounding districts; practical ability and good knowledge audio-frequency engineering essential; specialized training in London provided; applicants must reside in or near Bedford or Greater London area and must hold clean driving licence; good telephone contact facilities essential; salary to scale £400-£450 plus car allowance and expenses; state age, education and experience and whether car owner.—Box 3267. [9255

VALVE Development Engineers are required by the Nelson Research Laboratories, English Electric Co., Ltd., Stafford in an expanding section of the laboratories; applicants should have Inter B.Sc. or higher qualifications with development or production experience in the manufacture of mercury vapour or high vacuum tubes; a knowledge of glassworking machines and drawing office routine would be a useful asset; please write giving full details and quoting reference 306B to—Central Personnel Services, English Electric Co., Ltd., 356, Strand, London, W.C.2. [9257

MURPHY Radio invite applications for posts as development engineers in their Electronics Division; applicants should have degree in engineering or physics or equivalent qualifications, preferably with some industrial experience and, should be capable of undertaking original development work and leading a design team; employment is permanent and pensionable and offers excellent opportunity of broadening experience.—Applications, giving full details of experience and qualifications, may be forwarded in confidence to Personnel Manager, Murphy Radio Ltd., Welwyn Garden City. [9257

DECCA RADAR, Ltd., invites applications from microwave, electronic and mechanical engineers to join the Company in its extensive work in a wide field of microwave link and radar development; the Company offers excellent starting salaries and first rate opportunities for men to exploit their initiative and to rise rapidly to responsible posts; graduates without industrial experience who are prepared to undertake intensive training are also invited to apply for junior posts—Apply in writing to Research Director, Radar Laboratory, 2, Tolworth Rise, Surbiton, Surrey. [0240

DECCA RADAR, Ltd., require draughtsmen and junior draughtsmen for research drawing office, preferably experienced in any of the following fields: radar, radio and electronic circuits, electro-mechanical devices, light mechanical engineering; knowledge of workshop practice essential; applicants must posses Ordinary National Certificate or equivalent; positions are permanent and progressive; salaries based on A.E.S.D. rates; tracers (female) also required.—Write giving ful details to Chief Draughtsman, Decca Radar, Ltd., 2, Tolworth Rise, Surbiton, Surrey. [0241

THE General Electric Co., Ltd., Brown's Lane, Coventry, require for work on guided weapons and like projects, development engineers, senior development engineers, mechanical and electronic, for their development laboratories; fields include microwave and pulse applications; salary range £400-£1,250 per annum; vacancies also exist for specialist engineers in component design, valve applications, electro-mechanical devices and small mechanisms; the company's laboratories provide excellent working conditions with social and welfare facilities, superannuation scheme, assistance with housing in special cases; apply by letter stating age and experience, to—The Personnel Manager (Ref. CHC). [0235

MINISTRY OF SUPPLY has experimental officer class vacancies in Research and Development Establishments; most posts concern guided weapons, and require knowledge and experience of electronics; minimum qualification H.S.C. (Science) or equivalent but higher qualifications in Physics or Electrical Engineering may be advantage; salaries according to age, experience, etc., within ranges: experimental officer (min. age 26) £597-£754; assistant experimental officer, £264 (age 18)—£555; women somewhat less; posts unestablished.—Application forms from M.O.S.N.S., Technical and Scientific Register (K), Almack House, 26, King St., London, S.W.1, quoting A253/52/A. Closing date December 15, 1952. [9287

SITUATIONS WANTED

EXPERIENCED radio and TV engineer requires post with accom. in West of England.—Box 3514. [9311

RADIO engineer requires first-class part-time assembly work; full testing facilities available; experience of Government specifications; prototype design undertaken.—Box 3212. [9240

"TYANA" SOLDERING IRON 16/9

The Perfect Small Soldering Instrument—overall length 11in., diameter of bit $\frac{1}{4}$in.

- Adjustable Bit
- Easy to handle.
- Weight approx. 4 ozs
- Heating Time 3 min
- 40 Watt economy Consumption
- Standard Voltage Ranges. (Other Ratings Available on Request.)
- Long Life and Efficiency.
- Replacement Elements and Bits always available.

Just the Convenient Iron Required for Intricate and Fine Soldering.

Regd. Design No. 867804

Maintenance Service for industrial users.
British made by—
KENROY LIMITED
152/297 UPPER ST., ISLINGTON
LONDON, N.1.
Telephone: Canonbury 4905-4663

Easco **RECTOSTAT**
Registered Trade Name
HOME BATTERY CHARGERS
2 Amp. 6-9-12 Volt. A.C. Mains
Price £5. 18. 6

EASCO ELECTRICAL LTD.
6/8 BRIGHTON TERRACE, LONDON, S.W.9
Telephone: BRixton 4961-2-3

HERE'S NEWS!

Kit, less valves **£3 . 3 . 6** P. & P. 2/-
Fully wired and tested **£4 . 3 . 6** P. & P. 2/6

Garrard RC72A auto-changers £14.19.6. Collaro gram. units, £4.19.6. Lane tape decks, £15.15-. Shadbolt amplifiers £10.19.6. etc. Send now for list.

This amplifier will fit into all portable gramophones and record players. Dimensions 10in. × 3in. × 7½in. 4 watts quality output, suitable with all speakers and P.U.'s, standard or L.P. Valves 6J7, 6V6 extra if required. Stamp for Illustrations.

ELECTRO-ACOUSTIC LABS.
TAIN · ROSS-SHIRE · SCOTLAND

R. G. D.

require the following technical staff for their new Laboratories in Romford, Essex :—

1. Radio and Television development engineers, able to work with minimum of supervision and carry through a project up to production stage.
2. Draughtsman, both Senior and Junior, experience of Radio and Television preferable but not essential.

Write giving full details to **Radio Gramophone Development Co. Ltd., 3 Hampton Court Parade, East Molesey.**

WILCO ELECTRONICS

MAGNETIC TAPE RECORDING. "Motek" tape deck, with 3 motors, fast forward and rewind, high impedance R/play and erase heads. A really first-class job at £18 18/-. Post and pckg., 5/-. "Motek" R/play or erase heads 39/6, oscillator coils, with circuit 8/6. "Emitape," 1,200ft. 35/-, spare reels, 4/-. Post extra.

MICROPHONES. Moving coil, Dynamic, American make. Type 600C, £6 6/-.

MAINS TRANSFORMERS. Primary 230v., Secondary 350-0-350v., 80 m.A. 6.3v. 1A.; 6.3v. .5A. and 5v. 2A. Tapped Primary Surface mounting. 21/-. Post 1/6.

CHOKES. LF10H. 80 m.A. 7/6. Post 1/-.

"INEXPENSIVE TELEVISION." Revised and enlarged edition giving circuit of R1355 etc., also 45 m.c. Pye strip 2/6. Post 3d.

RECEIVER R1355. As specified for "Inexpensive Television." In original packing, as new. Complete with all valves, 30/6, carriage 7/6.

EF50 VALVES. Red Sylvanian, or British guaranteed unused, ex-new equipment, 7/6 each 6d.

RESISTANCE MATS.—Make ideal heating mats for Aquariums, Photographic solutions, Print dryers, etc. Mains voltage. Black Heat, size 10in. x 6in. Price 2/6, post free.

SLOW MOTION DIAL. With Vernier, 200-1 Reduction, front of panel mounting 6in. dia. calibrated 0-100. 5/6 each, post 1/-.

BATTERY CHARGER. Type 42A. Input 230 v. A.C. Output 6 or 12 v. 4 amps. In black crackle case with fuses, switch and meter, £5 5/-, carriage paid.

MOVING COIL METERS. 2½in. Flush Rectifier type. Scaled 0/100 volts A.C resistance 100 K ohms. A very useful meter with a 1 Milliamp movement, 30/-, post free.

These are just a few of the items in our stocks. Send 6d. in stamps for comprehensive list giving full details of Potentiometers, Condensers, Resistors, Switches, etc., etc.

264 LOWER ADDISCOMBE RD., CROYDON.

THE MODERN BOOK CO.

The Radio Valve Data. Compiled by "Wireless World." New 3rd Ed. **3s. 6d.** Postage 3d.

The Use of Radar at Sea. **30s.** Postage 1s.

Handbook of Line Communication. Volume One. **30s.** Postage 1s.

Television. By F. Kerkof and W. Werner. **50s.** Postage 1s.

Resonant Cavity Magnetron. By Boulding. **21s.** Postage 6d.

Electronic Measurements. By Terman and Pettit. **72s. 6d.** Postage 1s.

Vacuum Technique. By A. L. Reimann. **50s.** Postage 9d.

Amplifiers. By G. A. Briggs and H. H. Garner. **15s. 6d.** Postage 6d.

Sound Recording and Reproduction. By J. W. Godfrey and S. W. Amos. **30s.** Postage 9d.

The Williamson Amplifier. **3s. 6d.** Postage 3d.

Television Faults. By N. Stevens. **5s.** Postage 3d.

Time Bases. By O. S. Puckle. **32s.** Postage 9d.

The Radio Amateur's Handbook. By A.R.R.L. **30s.** Postage 1s.

Telephony. By J. Atkinson. Volume One. Price **35s.** Postage 9d. Volume Two. Price **55s.** Postage 1s.

A Comprehensive Radio Valve Guide. By W. J. May. **5s.** Postage 6d.

We have the finest selection of British and American radio publications in the Country. Complete list on application.

19-23 PRAED STREET,
(Dept. W.12)
LONDON, W.2
PADdington 4185

SITUATIONS WANTED

ELECTRONICS. B.Sc. (Eng.), aged 28, 4 years' service, 1 year's industrial experience, seeks opportunity for advancement in research or development. Present salary £526.—Box 3510. [8508]

BUSINESSES FOR SALE AND WANTED

RADIO Repair and Hire Business for sale; profits £750; stock goodwill; and 100 hire sets out to good clients; £1,500; modern furnished 6-roomed house, garage, workshop, large garden; £5,500 freehold; offers invited.—Trotter, 166, Stoke Rd., Slough, Bucks. [8996]

FOR sale wireless, television and electrical business in main road, North West London Suburb, with very little opposition; lock-up shop, lease nearly 14 years to run, at £500, rising to £525 per annum; fixtures and fittings £2,300; stock at valuation.—Write Box 2990. [9166]

PAINTS, CELLULOSE, ETC.

PAINT spraying handbook 3/6, post free; cellulose and synthetic paints and all spraying requisites supplied; catalogue free.—Leonard Brooks, 53, Harold Wood, Romford. [0207]

TECHNICAL TRAINING

CITY & Guilds (Electrical, etc.) on "no pass no fee" terms; over 95% successes; for full details of modern courses in all branches of electrical technology send for our 144-page handbook—free and post free.—B.I.E.T. (Dept. 586A), 17, Stratford Place, London, W.1. [0117

INDUSTRY needs trained men; send for free brochure giving details of our Home Study Courses in radio, television and all branches of electronics, we prepare students for the A.M.Brit.I.R.E., City and Guilds Telecommunications, R.T.E.B., and other professional examinations. Train with the college backed by Britain's largest electronic industry.—Write to E.M.I. Institutes, Postal Division, Dept. WW33, 43, Grove Park Rd., London, W.4. Chiswick 4417 (Associated with H.M.V.). [0179

TUITION

RADIO training.—P.M.G. exams and I.E.E. Diplomas; prospectus free.—Technical College, Hull. [0111

NOTHING succeeds like success! What we have done a thousand times we can do again for you—see the B.N.R.S. advt., page 126.

WIRELESS operating; attendance and postal courses.—Stamp for reply to Manager, The Wireless School, Manor Grove, London, N.7.

A.M.I.Mech.E., A.M.Brit.I.R.E., City and Guilds, etc., on "no pass—no fee" terms; over 95% successes; for details of exams. and courses in all branches of engineering, building, etc., write for 144-page handbook—free.—B.I.E.T. (Dept. 387B), 17, Stratford Place, W.1. [0118

SEE the world; radio officers urgently required; we train most in shortest period; training fees payable after appointments secured; scholarships available; boarders accepted. 2d stamp for prospectus from Britain's leading college.—Wireless College, Colwyn Bay. [0018

WIRELESS Telegraphy. — Merchant Navy offers to youths 15½ upwards when qualified, lucrative positions as radio officers.—Apply British School of Telegraphy, Ltd., 179, Clapham Rd., London, S.W.9. Also postal courses in theory of wireless for P.M.G. Certificates, and Amateur Transmitting Licence. [0124

THE Institute of Practical Radio Engineers have available home study courses in every phase of radio and television engineering, specialising in the practical training of apprentices in the retail trade; enrolments limited, fees moderate.—The Syllabus of Instructional Text may be obtained post free from the Secretary, I.P.R.E., Fairfield House, 20, Fairfield Rd., Crouch End, London, N.8. [0069

FREE! Brochure giving details of home study training in radio, television, and all branches of Electronics; courses for the hobby enthusiast or for those aiming at the A.M.Brit.I.R.E., City and Guilds Telecommunications, R.T.E.B., and other professional examinations; train with the college operated by Britain's largest electronic organisation; moderate fees.—Write to E.M.I. Institutes, Postal Division, Dept. W.W.28, 43, Grove Park Rd., London, W.4 (Associated with H.M.V.). [0001

BOOKS, INSTRUCTIONS, ETC.

25 vols. Nos. 28, July to Dec., 1931, to vol. 53, June to Dec., 1947.—Below.

3 VOLS., all bound and indexed, Nos. 54, June to Dec., 1948, to vol. 56, June to Dec., 1950.—Below.

¼ VOL., not bound nor indexed, No. 57 (part), Jan. to July, 1951.—H. Norman, Watts Close, Tadworth, Burgh Heath 358. [9278

BACK numbers of W.W. for sale 1/- each.—Shackle, Garth House, Brickfield Lane, Hayes, Middx. [9040

WW., Vols. 30, 32, 33, 34, 36, 46, 48, 52, 53, 54, 55, bound and indexed, £1 each.—Stevenson, Seabrighe, Bangor, Co. Down.

I.P.R.E. technical publications. 5,500 Alignment Peaks for Superheterodynes, 5/9, post free; data for constructing TV aerial strength meter 7/6; sample copy "The Practical Radio Engineer," quarterly publication of the Institute, 2/-; membership and examination data 1/-.—Sec., I.P.R.E., 20, Fairfield Rd., London, N.8.

We have a large stock of

HIGH STABILITY RESISTORS

Trade enquiries invited: Marris & Cartin Ltd., 42 Brook Street, London, W.1. GRO. 5571

A WINDOW WORTH LOOKING INTO

High Stab Resistors. 2 Meg 2% 1 watt. 6/- per dozen min. quantity.

Constant Voltage Transformers. Advance. Input voltage 190-260 @ 50 cycle. Output 230 volts @ 150 watts **£7 10/-.**

Venner Hour Meters for operation on 200/250 A.C. 50 cycle, synchronous movement, capacity zero-10,000 hours. **62/6** each, brand new.

Absorption Wave Meters. Ex-Admiralty type W7/474, coverage 100-280 Kcs., 200-900 Kcs., 700-1.5 Megs., 1-4 Megs., 4-10 Megs., 9-18 Megs., 14-30 Megs. Complete with charts and 0-500 Microamp meters, **£5 10/-** each.

Auto Transformers. 110-250 volts 100 watts, **15/6.** 1,000 watts, separately wound, **£6 10/-.** Ditto, 3,000 watts, **£10 10/-.**

Meters. 0-1 mA. 2½in. flush mounting, **25/-** each. R.F. 0-350 mA, **5/6** each. 2in. round F.M.

Relays. All types in stock from **2/6** each, send us your enquiries.

Welding Transformers. Input voltage 230 volts 50 cycle, output 13/16 volt, 65/75 amps, **82/6** each.

Micro Switches. Large stocks available. Send us your enquiries.

Mains Transformers. Ex-W.D. Input voltage 230 volt A.C., output 500 + 500 volt 170 mA, 4 volt 3 amp, **22/6** each.

Smoothing Chokes. Ex-W.D. 15 Henries 275 mA, Resistance 125 ohms, **10/6** each.

Television Coil Formers with iron dust cores "Polystyrene" 1in. × 4in., single hole fixing, **6d** each, **5/6** per dozen. Television Condensers 1,000pF Midget Moulded Mica wire ends, **6d.** each, **5/-** per dozen.

Dural Masts, Telescopic 15in. to 7ft. 6in., **2/6** each, ideal for making your own T/V aerial.

Organ Switches. Ex-"P.W." Electric Organ, **1/6** each. All other parts ex-stock.

Bendix Command Rotary Transformers. 12 volt input plug in type, output 250 volts 60 mA, **29/6** each.

Pots 10 K. wire wound 3 watt rating, 1/3 each. Carbon Ditto 10 K. and 100 K., 9d. each. Min. quantities 12.

R1155 Receivers. Brand New in sealed boxes, aerial tested, **£11 19/6** each.

Rectifiers, Metal. 850 volts 30 mA, **8/6** each. 10 volt full wave ½ amp., **6/9** each. 12 volt 3½ amp., full wave, **10/9** each.

Valves. Brand New and Boxed. VU111, 4 volt E.H.T. Rectifiers, **2/6** each.

Microamp Meters 0-50, 2in. round flush mounting, **42/6** each.

Microamp Meter 0-100 2½in. round flush mounting, **39/6** each.

B7G Holders. Ceramic with bottom screen, **10/6** per dozen.

H.R.O. 6 Volt Vibrator Power Supply units Type 6/8s, brand new, **52/6** each.

Rotary Converters. 24 volt D.C. input, 230 volt A.C. 50 cycle output @ 100 watts, **92/6** each. Ditto 12 volt input, **102/6** each.

A.C. Mains Transformers. 200/250 volt input, output 45 volt 4 amp, **19/6** each.

Don't forget your postages.
Open all day Saturday.

G. W. SMITH & CO.
(RADIO) LTD.
3 LISLE STREET, LONDON, W.C.2
Telephone: GERrard 8204/9155

B. & H. RADIO
EAST STREET, DARLINGTON

ANTI-STATIC AERIAL
Easily fitted to chimney stack. Complete with coaxial and fittings £3 5 0
BASS & TREBLE SEPARATOR KITS
Mod. A. 6DB per octave £1 19 0
Mod. B. 12DB per octave £2 16 0
SCRATCH FILTER £1 5 0
VARIABLE SELECTIVITY I.F. TRANSFORMERS 465 K/CS. (per pair) £1 7 6
9 K.C.S WHISTLE FILTER Narrow trough better than 40DB down £2 12 6
INTERFERENCE SUPPRESSORS Ex-Govt. but fitted 1,000 volt condensers 17 6

MORLEY TRANSFORMERS
Quotations for Specials and Rewinds by return.
Mains Trans. Tapped pri. 200-250 v. 60 ma., 350-0-350, 6.3 v. 4 a., 5 v. 3 a. Ditto 300 v. and 250 v. C.T. 21/-.
Williamson. Fully shrouded 425-0-425 v., 180 ma., 6.3 v. 4 a., C.T. 5 v. 3 a., 47/6.
Constructors' T.V. Fil. Trans. Pri. 0, 195, 210, 230, 245 v. Secs. 6.3 v. 7 a., 6.3 v. tapped 2 v. 2 a., 35/-.
Quality P.P. O/P Trans. Heavy duty 6V6 etc. to 2 ohms 70 ma., 4/6.
O.P Trans Heavy duty 6V6 etc. to 2 ohms 70 ma., 4/6.
Shrouded and tagged, 5/6.
2, PAWSONS RD., W. CROYDON. THO 1665

RADIO COMPONENT SERVICE
TRF Chassis Punched 4/3 each.
TRF Coils MW dust cored 5/9 per pair.
TRF Coils L.M.W. Air spaced 7/6 per pair.
Superhet Coils dust cored 2/9 each.
I.F.s dust cored 11/- per pair.
Send stamp now for New Catalogue.
All goods Guaranteed Write to:
Radio Component Service
68 Chesterfield Road, Leyton. E.10 LEY 4380

14 Day (& Electric) Automatic Switches
Reconditioned. Guaranteed one year, for controlling Window & Poultry lighting, heating, etc.
From **50/-** EACH
Write for illustrated lists:
DONOHOE'S (Timers), 6, GEORGE ST., NORTH SHIELDS, NORTHUMBERLAND.

TESTOSCOPE *Mains Tester*

For high and low voltage testing :—
1/30 and 100/850 volts A.C. or D.C. Write for interesting leaflet 30F.
RUNBAKEN · MANCHESTER 1

SPECIALISED REPAIR SERVICE
WEBB'S Radio
specialise in the repair and alignment of complex communication receivers
All makes of English and American communication receivers completely overhauled to satisfy makers' original test specification. Calibration over entire coverage of tuning range. We issue a test report giving sensitivity—selectivity—signal/noise ratio on I.F.s, and sensitivity—image ratio—signal/noise—A.V.C. characteristics overall.
Recognised Service Agents for EDDYSTONE, R.C.A. HALLICRAFTER, etc
WEBB'S RADIO
14 Soho Street, London, W.1. Gerrard 2089

We require urgently following American Radio Valves for which we will pay a high price. Any quantity, large or small.
813, 808, 807, 4C27 (CV92), 723AB.
Phone or write :
ALTHAM RADIO CO.,
Jersey House, Jersey St., Manchester 4
Tel.: Deansgate 5387

WE PAY UP TO £30
for BC 312 receivers in good original condition complete with dynamotor.
Offers to
Box 1748 c/o "Wireless World"

TOROIDAL INDUCTORS
We have Winding Capacity available and from stock for immediate delivery.
BEL SOUND PRODUCTS CO.
Marlborough Yard, London, N.19
Tel. : ARChway 5078

'Radiospares' Quality Parts
THE SERVICE ENGINEER'S FIRST CHOICE

TRANSFORMERS & COILS TO SPECIFICATION
MANUFACTURED OR REWOUND
Filter Coils ± 1% a Speciality.
JOHN FACTOR LTD.
9-11 EAST STREET, TORQUAY, DEVON
'Phone : Torquay 2162

TELECRAFT
AERIALS ENSURE THE
BEST TELEVISION
TRY ONE AND SEE FOR YOURSELF

TANNOY
SOUND EQUIPMENT
clearly the best for all occasions

NUTS, BOLTS, SCREWS AND WASHERS
ALL CADMIUM PLATED
SET 306 (Size 5BA). Assorted screws and bolts from 5/16in. to 1¼in. long, with plain hex. nuts, Pinnacle nuts, double anchor nuts, lock washers and plain washers. All rust proof. **Average Contents, 480 Pieces 7/6**, plus 6d. post.
SET 306 (Size 4BA). Assorted screws and bolts from ¼in. to 1¼in. long, with plain hex. nuts, Simmonds nuts, and plain washers. All rust proof. **Average Contents, 600 Pieces, 7/6**, plus 6d. post.
SET 307 (Size 6BA). Assorted screws from ¼in. to 1¼in. long, with plain hex. nuts, Simmonds nuts, shake proof washers, and plain washers. All rust proof. **Average Contents, 760 Pieces, 7/6**, plus 6d. post.
By post, air-freight or ship, anywhere in the world. All nuts well packed in compartmented boxes.
BERNARD F. WADE LTD.
2, WELLINGTON RD., ILKLEY, YORKS.
Tel.: Ilkley 1707

VOIGT
In 1933 WE introduced the **TWIN DIAPHRAGM.** Pat. No. 413 758
Pre-War and Post-War. Goodmans were licenced. About 1950 (17 years later), a U.S. firm adopted the idea.
VOIGT DESIGNS LEAD THE WAY.
VOIGT PATENTS LTD., S.E.25. SYD 6688.

MAGNETIC TAPE RECORDERS and COMPONENTS
from
WILL DAY, LIMITED
19 Lisle Street, London, W.C.2.
GERrard 7105 and 4476
SEND 1½d. STAMP FOR LIST—SENT BY RETURN

RELAYS try KAYES.
We Build them at competitive prices.
UNIVERSAL ENGINEERING CO.
(Subsidiary)
11, ST. ANNS ROAD, HARROW, Middlesex.
Telephone: HARrow 1432.

RADIO & TELEVISION COMPONENTS
WE OPERATE A PROMPT & EFFICIENT MAIL ORDER SERVICE.
"VIEWMASTER" & "TELE-KING" specialists
Easy terms available.
JAMES H. MARTIN & CO.,
FINSTHWAITE, NEWBY BRIDGE, ULVERSTON, LANCS.

YOUR METER DAMAGED?

Leading Electrical Instrument Repairers to the Industry
Contractors to The Ministry of Supply.
Repairs by skilled craftsmen of all makes and types of Voltmeters, Ammeters, Microammeters, Multirange Test meters, Electrical Thermometers, Recording Instruments, Synchronous Clocks, etc. Quick deliveries—for speedy estimate send defective instrument by registered post to :—
L. GLASER & CO.
Electrical Instrument Repairers
56-100 ALDERSGATE STREET, E.C.1
(Tel.: MONarch 6822)

THE "FLUXITE QUINS" AT WORK

"This leaf of mine ought to be shot.
No wonder my aunt's not so hot.
The earth feeds all right,
Fixed tight with FLUXITE.
But look where it is! Gone to pot!!"

See that **FLUXITE** is always by you—in the house—garage—workshop—wherever speedy soldering is needed. Used for over 40 years in Government works and by leading engineers and manufacturers. Of all Ironmongers—in tins from 1/- upwards.

TO CYCLISTS! For stronger wheels that will remain round and true, here's a time tested tip. Tie the spokes where they cross with fine wire AND SOLDER. It's simple—with FLUXITE—but IMPORTANT.

FLUXITE
SIMPLIFIES *ALL* SOLDERING

Write for Book on the Art of "SOFT" soldering and for leaflet on CASE-HARDENING STEEL and TEMPERING TOOLS with FLUXITE. Price 1½d. ea.

FLUXITE LTD.,
BERMONDSEY STREET, LONDON, S.E.1.

INDUCTA

TRANSFORMERS
of all types up to 25 KVA for Single or Three Phase operation, Phase Conversion, etc.

MAINS
Output and Special Purpose Transformers for Radio Equipment, Chokes, etc.

COILS
for Contactors, E.M. Brakes, Air Valves, etc., and COIL WINDINGS for all purposes.

SOLENOIDS
for A.C. and D.C. Operation.

A.I.D. Approved

W. F PARSONAGE & Co LTD
INDUCTA WORKS
PARK RD · BLOXWICH · WALSALL

AERIAL MASTS

Again we have been fortunate to secure a limited number of 13ft. WOODEN MASTS, approx. 2in. dia. slight taper and ideal for television chimney masts, etc.
PRICE 7/6 EACH. Carriage 2/6 or IN LOTS OF 4 OR OVER 6/- EACH, Carriage 3/-.
T.V. DIPOLE AERIALS. For all channels. Heavy Bakelite Insulator and ⅜in. dia. elements for inside or outside use. (Please state for which station when ordering.)
15/- EACH, PACKING AND CARRIAGE 2/6.
POLYETHELYNE DIPOLE INSULATORS fitted with ⅜in. dia. Brass stubs, with your own elements and a small amount of ingenuity a very highly efficient aerial system can be constructed.
PRICE 5/-, postage 1/6.

WALTON'S WIRELESS STORES
48, Stafford Street, WOLVERHAMPTON
Send s.a.e. and 3d for latest list.

THE
—THE HYNDBURN—
QUALITY
TAPE RECORDER
IS THE APPARATUS
YOU HAVE BEEN WAITING FOR

AVAILABLE COMPLETE OR IN KIT FORM.

WE CAN ALSO SUPPLY THE
HOME CONSTRUCTOR
WITH FLY WHEELS, SPOOL CARRIERS, TAPE MECHANISMS, ETC.

Details from:
HYNDBURN ELECTRONICS LTD.,
2 & 4, Croft Street, Accrington.
Phone: Acc. 4526. LANCS.

"Always a good deal" at
WEST END RADIO LTD.

BATTERY CHARGER KITS. 12 v. 4 amps. and 6 volts 6 amps. Consisting of trans., selenium rectifier, pilot lamp and switch in handsome metal cabinet finished black crackle, 8in. x 6in. x 6in., complete, 59/6.
DESK TYPE RECORD PLAYER CABINETS. In solid oak. Dims., 16in. x 15in. x 8in. Lift-off front. 39/6 each, carr. 5/-.
TV CABINETS. New design console in walnut. 33in. x 16in. x 20in. Will take up to 12in. tube. £7/15/-, carr. 12/6.
COMMUNICATION RECEIVERS. THE FAMOUS CR100/2 EX-NAVY COMMUNICATION RECEIVER. 11 valves, crystal control, built-in power pack, 200-250 volts A.C., 6 bands, etc., etc. £29/10/-. As new. **R.C.A. AR77.** 10 valve communication receivers for 200-250 v. A.C. with B.F.O., A.V.C., N.F.B. Crystal control, noise limiter, band-spread etc., etc. Reconditioned as new and guaranteed. £39/10/-. R1155 mains power pack and O.P. stage with tone control. £4/15/-.
1,000 BARGAINS FOR CALLERS.
PLEASE ADD POSTAGE.

WEST END RADIO LTD.
14, LISLE ST., LEICESTER SQUARE, LONDON, W.C.2. Phone: GER. 7341
Open all day Saturday. No lists at present.

OPPORTUNITIES IN RADIO

Get this FREE Book!

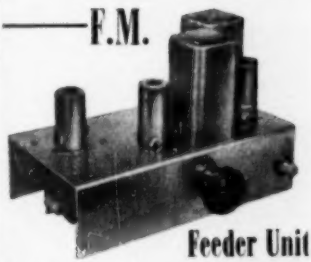
● **ENGINEERING OPPORTUNITIES'** reveals how you can become technically qualified at home for a highly paid key-appointment in the vast Radio and Television Industry. In 144 pages of intensely interesting matter, it includes full details of our up-to-the-minute home study courses in all branches of **TELEVISION and RADIO, A.M. Brit. I.R.E., City & Guilds, Special Television, Servicing, Sound Film Projection, Short Wave, High Frequency and General Wireless Courses.**

We definitely Guarantee
"NO PASS—NO FEE"

If you're earning less than £15 a week this enlightening book is for you. Write for your copy today. It will be sent **FREE** and without obligation.

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY
369b SHAKESPEARE HOUSE,
17/19 STRATFORD PLACE, LONDON, W1
BIET

—F.M.



Feeder Unit

Simple and inexpensive; described in Sept. and Oct. "W.W." articles. Receives B.B.C. high fidelity Wrotham experimental transmissions.
Send stamp for priced list of components including drilled chassis, coils wound to designers' specifications. Detector unit illustrated below.

Assembled and Tested complete with valves
£7.5.0

New
The Quality Cube

Superlatively better definition of middle and higher frequencies used with any good speaker of 10in. or larger size. *High fidelity without "glitter" at last—and at small cost!* The small, attractive walnut veneered cabinet includes the new W.B. Pressure Type H.F. Unit and a 2.5 kcs cross-over network to match 15 ohms. Only four external connections.
£6.6.0
W.B. Unit alone, 75/6; Cross-over units to order from 45/-

QUALITY MART
8a Dartmouth Park Avenue,
London, N.W.5.
Mail Orders Only. **GULliver 1131.**

INDEX TO ADVERTISERS

A.B. Metal Products, Ltd. 7
Acoustic Products, Ltd. 37
Acoustical Mfg. Co., Ltd. 51
Acru Electric Tool Mfg. Co., Ltd., The 142
Adcola Products, Ltd. 46
Advance Components, Ltd. 15, 26
Aerialite, Ltd. 95
Aircraft Radio Industries, Inc. 118
Allen Components, Ltd. 129
All-Power Transformers, Ltd. 98
Alpha Radio Supply Co., The 155
Altham Radio Co. 90, 140
Amplex Appliances (Kent), Ltd. 118
Amplivox, Ltd. 104
Anders Radio, Ltd. 120
Antiference, Ltd. 24
Arcolectric Switches, Ltd. 34
Armstrong Wireless & Television Co., Ltd. 43, 129
Arrow Electric Switches, Ltd. 124
Ashdown, H. 150
Ashworth, H. 28
Associated Cine Equipments, Ltd. 64
Astor Boiseller & Lawrence, Ltd. 92
Automatic Coil Winder & Electrical equipment Co., Ltd., The 1
Automatic Telephone & Electric Co., Ltd. 14
Autoset (Production), Ltd. 48
A.W.F. Radio Products 116
B & H Radio 140
Baird Television, Ltd. 56
Bakers "Selhurst" Radio 36
Barker Natural Reproducers 131
Bel Sound Products, Ltd. 140
Belling & Lee, Ltd. 75
Bennett College, Ltd., The 54
Berry's (Short Wave), Ltd. 97
Bird, B. S., & Son, Ltd. 86
Birmingham Sound Reproducers, Ltd. 70
B.K. Partners, Ltd. 40
Bradmatic, Ltd. 96
Britain Chas. (Radio), Ltd. 117
British Communications Corpn., Ltd. 64
British Ferrograph Recorder Co., Ltd. 55
British Institute of Engineering Technology 122, 141
British Insulated Callender's Cables, Ltd. Cover ii
British National Radio School 126
British Physical Laboratories 22, 54
British Sarosal, Ltd. 122
Brookes Crystals, Ltd. 158
Brown, S. G., Ltd. 52
Bulgin, A. F., & Co., Ltd. Edit. 527, 114
Bull, J., & Sons 65
Bullers, Ltd. 95
Candler System Co. 154
Chaffey Cabinet Co., The 122
Champion Products 128
Chapman, C. T. (Reproducers), Ltd. 129
Cinema Television, Ltd. 15
City & Rural Radio 92
City Sale & Exchange, Ltd. 92
C.J.R. Electrical & Electronic Development, Ltd. 90
Classic Electrical Co., Ltd. 62, 63
Clydesdale Supply Co. 108, 109
Cohen, D. 119
Cosmocord, Ltd. 74
Cossor, A. C., Ltd. 76
Coventry Radio 155
Davis, Alec, Supplies, Ltd. 46, 122, 157
Davis, Jack (Relays), Ltd. 114
Day, Will, Ltd. 130
Direct T.V. Replacements 46
Donoe s (Timers) 150
Dubilier Condenser Co. (1925), Ltd. 29
Duke & Co. 154
Dulci Co., Ltd., The 157
Dun (Electronics) & Co. 154
Easco Electrical, Ltd. 155
Edison Swan Electric Co., Ltd. 33, 90
Electradix Radios 152
Electrical Instrument Repair Service, The 158
Electro Acoustic Developments 128
Electro Acoustic Industries, Ltd. 55
Electro-Acoustic Laboratories 158
Electronic Precision Equipment 100, 101, 102, 105
Elm Electric Co. 96
E.M.G. Handmade Gramophones, Ltd. 156
E.M.I. Factories, Ltd. 4
E.M.I. Institutes 46, 82
Engineering Associates 156
English Electric Co., Ltd., The 47
Enthoven Solders, Ltd. 5
Excel Sound Services, Ltd. 88
Factor, J., Ltd. 140
Ferranti, Ltd. 12
Field, Norman H. 120
Fielden (Electronics), Ltd. 24
Fluxite, Ltd. 147
Foyle, W. & G., Ltd. 116
Franks, H. 140
Frith Radiocraft, Ltd. 98
Gaipins 125
Garland Bros. 110, 111
Garrard Engineering & Mfg. Co., Ltd., The 54
Gee Bros. Radio, Ltd. 151
General Electric Co., Ltd. 57
General Motors, Ltd. (Frigidaire Division) 58
G.L. Electronics 156
Glaser, L., & Co. 140
Goodmans Industries, Ltd. 26
Goodsell, Ltd. 48
Grampian Reproducers, Ltd. 42
Gray, Arthur, Ltd. 104
Hall Electric, Ltd. 6
Hallam, Sleigh & Cheston, Ltd. 58
Hanney, L. F. 94
Hayes Co., The 156
Haynes Radio, Ltd. 152
Henley's, W. T., Telegraph Works Co., Ltd. 150
Henry's 121
Hivac, Ltd. 91
Hivolt, Ltd. 42
Holle, Arthur 130
Holley's Radio Stores 127
Homelab Instruments, Ltd. 66
Howorth, P. 122
H.P. Radio Services, Ltd. 99
Hunt, A. H., Ltd. 11
Hyndburn Electronics, Ltd. 141
Iliffe & Sons Ltd. 98
Imhof, Alfred, Ltd. 62
Industrial Electronics 152
International Correspondence Schools 92
Jay Developments 40
Joyce, Loebl & Co., Ltd. 94
Kenroy, Ltd. 156
Kolectric, Ltd. 126
Kosikie, B. 116
Lasky's Radio 105, 106, 107
Leak, H. J., & Co., Ltd. 85
Leevers-Rich Equipment, Ltd. 122
Lewis Radio Co. 93
Lockwood & Co. 154
London Central Radio Stores 127
Lowther Mfg. Co. 55
L.R. Supply Co., Ltd. 57
Lyons Radio Co. 120
Mail Order Supply Co. 67, 68, 69
Marconi Instruments, Ltd. 39
Marconi's Wireless Telegraph Co., Ltd. 76, 79, 83
Marris & Cartin, Ltd. 156
Martin, J. H. 140
Marks, C., & Co. 116
Mayco Electric Co. 59
McElroy-Adams Mfg. Group, Ltd. 120
McMurdo Instruments Co., Ltd. 20
Measuring Instruments (Pullin), Ltd. 52
Miers, N., & Co., Ltd. 64
Minnesota Mining & Mfg. Co., Ltd. 57
Modern Book Co. 139
Modern Electrics, Ltd. 90
Morley Transformers 140
M.R. Supplies, Ltd. 66
M.S.S. Recording Co., Ltd. 43
Mullard, Ltd. 3, 16, 42, 51, 72
Multicore Solders, Ltd. Cover iv
Murex, Ltd. 66
Neo Electrical Industries, Ltd. 156
Norman, J. & S., Ltd. 50
Northern Radio Services 94
Nusound Products 155
Oddie, Bradbury & Cull, Ltd. 150
Osmor Radio Products, Ltd. 89
Palmer, O. A. S. 88
Pantek Magnetic Recording, Ltd. 2
Parker, A. B. 98
Paramount W. F. & Co., Ltd. 141
Partridge Transformers, Ltd. 125
P.C.A. Radio 114
Pearce, T. W. 154
Pearson, M. & J. 152
Philips Electrical, Ltd. 86
Post Radio Supplies 156
Pratts Radio 116
Premier Radio Co. 59, 60, 61
Pye Telecommunications, Ltd. 8
Quality Mart 141
Quartz Crystal Co., Ltd. 152
Radio & Electrical Mart, The 120
Radio Component Service 140
Radio Exchange Co. 116
Radio Mail 44
Radiomenders, Ltd. 98
Radio Merchandise Co., Ltd. 128
Radio Resistor Co., Ltd., The 21
Radiospares, Ltd. 140
Radio Supply Co. 115
Radio Traders, Ltd. 99
Rainbow Radio Mfg. Co., Ltd. 104
Reddifon, Ltd. 50
Reosound Engineering & Electrical Co. 156
Reproducers & Amplifiers, Ltd. 95
R.G.D. Co., Ltd. 156
Ridgway, J. R., & Co. 156
Robinson, F. C., & Partners, Ltd. 28
Roding Laboratories 56
Rogers Development Co. 44
Rola-Celestion, Ltd. 18
Rollett, H., & Co., Ltd. 150
Rudman Darlington (Electronics), Ltd. 44
Runbaken Electrical Products 152, 140
Ryall, G. A. 124
Salford Electrical Instruments, Ltd. 20
Sallis, A. T. 126
Samsons Surplus Stores 156
Sangamo Weston, Ltd. 84
Savage Transformers, Ltd. 150
Savage, W. Bryan, Ltd. 88
Sifam Electrical Instruments Co., Ltd. 36
Simmonds Aerocessories, Ltd. 23
Simon Sound Service 27
Sky-Marts 124
Smith, G. W., (Radio), Ltd. 159
Smith, H. L., & Co., Ltd. 150
Smith, W. H., & Son, Ltd. 97
Solartron Laboratory Instruments, Ltd. 32
Sound Sales, Ltd. 84
Southern Radio Supply, Ltd. 124
Spencer-West 116
Standard Telephones & Cables, Ltd. 10, 75, 77
Steatite & Porcelain Products, Ltd. 49
Stern Radio, Ltd. 112, 113
Stratton & Co., Ltd. 57
Sugden, A. R., & Co. (Engineers), Ltd. 30
Supermalli 133
Szymanski, S. 96
Tannoy Products, Ltd. 140
Taylor Electrical Instruments, Ltd. 19
Telecraft, Ltd. 91, 140
Telegraph Condenser Co., Ltd. Cover iii
Telegraph Construction & Maintenance Co., Ltd., The 45
Telemechanics, Ltd. 52
Tele-Radio (1943), Ltd. 125
Tenaplas (Sales), Ltd. 154
Thermionic Products, Ltd. 54
Trix Electrical Co., Ltd. Edit., 525
Truesound, Ltd. 41
Truvox, Ltd. 9
Unitel Electric 122
Universal Electronics 118
Universal Engineering Co. 140
University Electrical Instruments Corpn. 114
University Radio, Ltd. 104
Valradio, Ltd. 62
Verdik Sales, Ltd. 35
V.E.S. Wholesale Services, Ltd. 118
Voigt Patents, Ltd. 140
Vortexion, Ltd. 81
Wade, B. F., Ltd. 140
Walton's Wireless Stores 141
Waveforms, Ltd. 128
Wayne Kerr Laboratories, Ltd., The 50
Webb's Radio 52, 140
West End Radio, Ltd. 141
Westinghouse Brake & Signal Co., Ltd. 26
Wharfedale Wireless Works 58
Wilco Electronics 139
Wilkinson, L. 120
Woden Transformer Co., Ltd. 18
Wolf Electric Tools, Ltd. 22
Wright & Weire, Ltd. 82
Young, C. H. 118

THE NEW ACRU "L.V."

is a *REAL* miniature electric soldering iron

Now on the market and can be supplied for 6, 12 or 24V. with or without suitable mains Transformer.

The life of the ACRU "L.V." is practically unlimited, since the core and tube carrying the element and connections are made of **STAINLESS STEEL.**

Ask for New Leaflet

THE ACRU ELECTRIC TOOL MFG. CO., LTD.,

CHAPEL STREET, LEVENSHULME, MANCHESTER, 19

Tel. RUSholme 4613

Printed in Great Britain for the Publishers, Iliffe & Sons, Ltd., Dorset House, Stamford St., London, S.E.1, by THE CORNWALL PRESS LTD., Paris Garden, London, S.E.1. *Wireless World* can be obtained abroad from the following: AUSTRALIA AND NEW ZEALAND: Gordon & Gotch, Ltd. INDIA: A. H. Wheeler & Co. CANADA: The Wm. Dawson Subscription Service Ltd. SOUTH AFRICA: Central News Agency, Ltd., William Dawson & Sons (S.A.), Ltd. UNITED STATES: The International News Co.

LEADERSHIP
in the service of Industry
throughout the world
From the Arctic to the tropics, from the African jungle to the pampas of the Argentine — from the stratosphere to the subterranean ocean depths — wherever there is electrical equipment, you will find T.C.C. Condensers. Their unchanging service in every climatic condition maintains the tradition of leadership which was first established in 1906.
TCC
Mr. Quest and Mr. Test —
Symbols of Condenser Perfection
THE TELEGRAPH CONDENSER CO. LTD
RADIO DIVISION · NORTH ACTON · LONDON · W.3 · Tel: ACORN 0061

ERSIN *Multicore*

INTERNATIONALLY PREFERRED BY LEADING TELEVISION MANUFACTURERS

Solder Rings

Made from Arax or Ersin Multicore Solder or solid wire. These butt-jointed rings are much more economical to purchase than stamped washers, which can also be supplied. Among the specifications of Ersin Multicore Solder Rings, which are already being manufactured and for which prompt delivery can be given, are :—

Internal Diameter .. $\frac{1}{4}$", $\frac{5}{8}$", $\frac{3}{4}$", 1".

Other sizes to special order.

Liquid Fluxes

For dipping purposes or other processes where it is not convenient to use Ersin and Arax Multicore Solders, the Ersin and Arax Fluxes are now available as liquids. Ersin Liquid Flux is an extra-active non-corrosive flux A.I.D. approved and has been widely used by Electronic Manufacturers in the U.S.A. Bulk price for 1-gallon tins for Manufacturers on application. 10 fl. oz. tins

6/- each (subject)

SIZE 1" CARTON, 5/- (SUBJECT)

Catalogue Ref. No.	Alloy Tin Lead	S.W.G.	Approx. length per Carton
C.16014	60.40	14	18 feet
C.16018	60.40	18	47 feet
C.14013	40.60	13	16 feet
C.14016	40.60	16	34 feet

Radio and T/V Service Engineers' 1-lb. Reels

An economy pack for Service Engineers and Workshops using fair quantities of solder. 1-lb. reel containing approximately 167 feet of 18 s.w.g. 50/50 alloy packed in an attractive yellow and black carton, cat. ref. R.5018

15/- each (subject)